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THE IRON AGE

THE NATIONAL METALWORKING WEEKLY October 6, 1949

OCT 6 1949

They started out together in 1932 at the Inland Steel Company, Indiana Harbor Works, East Chicago, Indiana. That was more than 17 years ago. They are still together today; still rolling steel with the same speed, efficiency and dependability.

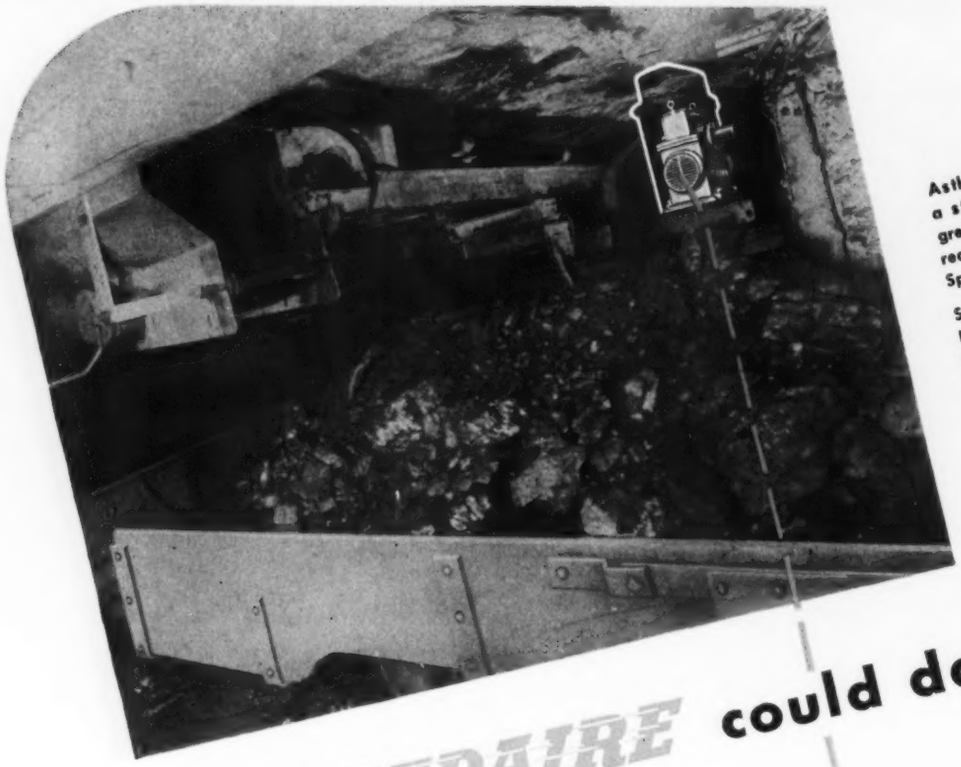
The bearing has a total of 6,154,648 tons to its credit. A recent inspection indicated that it is good for many thousands more.

This is an old-style Timken roll neck bearing, 28½" x 46½" x 22½". For a similar job today we probably would specify a Timken Balanced Proportion bearing 32½" x 46" x 33¼". This would permit the use of larger, stronger roll necks and much greater bearing capacity.

THE TIMKEN ROLLER BEARING COMPANY
CANTON 6, OHIO
Cable Address "TIMROSCO"

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
ROLL NECK BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED [illegible] BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION



As the white outline indicates, a standard unit of much greater frame size would be required to do the work of Speedaire.

Speedaire-driven conveyor built by Goodman Manufacturing Company, operating in a Kentucky coal mine.

Only SPEEDAIRE could do this job!

FOUR important factors make Speedaire the only practical drive for this 30″ belt conveyor:

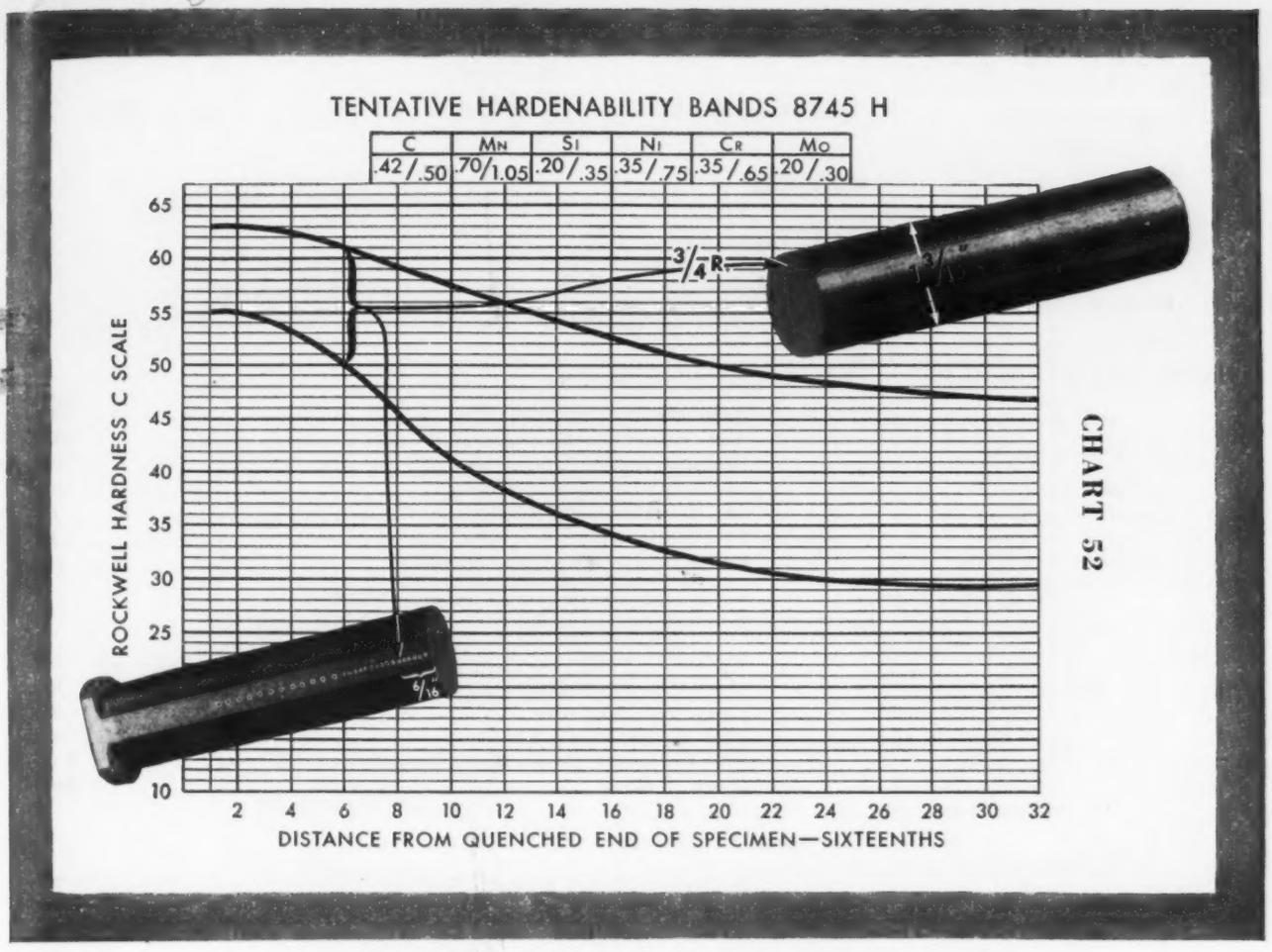
1. **Because of cramped quarters underground, a compact, powerful right-angle drive is a must.**
2. **Only 32¼″ high, the Speedaire unit is nearly 15 inches lower than a standard worm gear reducer of comparable size—vital for low ceilings.**
3. **This Speedaire weighs 1550 pounds less than a comparable standard unit. Lighter weight facilitates moving conveyor.**
4. **The Speedaire unit costs less than half as much as a standard worm gear drive of equal capacity.**

Speedaire is Cleveland's fan-cooled worm-gear speed reducer. Because it is fan-cooled, Speedaire will do more work—will deliver up to *double the horsepower* of standard worm units of equal frame size, at usual motor speeds. It can be installed economically on many applications where other types have been used heretofore—giving you the advantage of a compact right-angle drive. Speedaire gives the same long, trouble-free service characteristic of all Clevelands.

For full description, send for Catalog 300. The Cleveland Worm & Gear Co., 3252 East 80th St., Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

CLEVELAND
Worm Gear
Speed Reducers



This hardenability chart for 8745 H shows that the Rockwell hardness at a point 6/16 in. from the quenched end of a Jominy specimen is the same as that found at the three-quarter radius of a 1–3/16-in. bar section quenched in agitated oil.

How You Gain by ordering to Hardenability

Bethlehem's production of alloy "H" steels has more than doubled in the last two years. Progressive buyers of steels in all industries are now specifying hardenability bands to promote uniformity. This provides worthwhile advantages, as top extremes in hardenability frequently cause quenching cracks, and bottom extremes may mean failure to obtain the effectiveness of quench desired.

For example, a 1–3/16-in. round must be quenched in oil to produce Rockwell C-50 minimum hardness at the three-quarter radius. Standard cooling rate curves for a mildly-agitated oil quench show the commensurate distance from the hardened end of the end-quench test to be 6/16 in.

When this required distance is located on an established hardenability chart, such as the one illustrated, we find that 8745 H analysis will produce 50 minimum and 61 maximum hardness. This indicates that 8745 H meets these particular requirements. The possibility of getting an 8745 type steel of lesser or greater hardenability is eliminated if the "H" steel is ordered.

Hardenability charts similar to this have been published by the AISI covering all of the popular alloy steel grades.

Whether you order to hardenability or whether you use the conventional methods, Bethlehem metallurgists will be glad to help you with your analysis, heat-treatment and machining problems. We make all of the alloy steels listed by AISI, as well as special grades.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM ALLOY STEELS

BETHLEHEM STEEL ★

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OCTOBER 6, 1949 • • • VOL. 164, No. 14

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Dear Customer 339

Metal Congress to Stress

Economy in Production

ASM President—
HAROLD K. WORK,
director of research,
College of Engineering,
New York University.

Chairman,
Institute of Metals Div., AIME
F. N. RHINES,
professor of metallurgy
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Technology, Pittsburgh.

President, Society for
Non-Destructive Testing—
DANA W. SMITH,
chief research metallurgist,
Permanente Metals Corp.,
Spokane.

AWS president—
GEORGE N. SIEGER
president, SMS Corp., Detroit.

DEDICATED to the timely, practical theme of "Economy in Production," the 31st National Metal Congress and Exposition, scheduled for the week of October 17, in Cleveland, will represent the combined technical efforts of four participating societies in giving industry ideas of new ways of achieving this economy.

Formal technical presentations, educational lectures, round table discussions and seminars, conducted by the participating societies, the American Society for Metals, the American Welding Society, the American Institute of Mining and Metallurgical Engineers and the Society for Non-Destructive Testing, will result in a total of some 207 presentations.

The equipment exposition, which will be housed in the Public Auditorium, will contain about 350 exhibits also stressing the central theme.

Highlighting its technical program with a series of round table discussions on the show's theme "Economy in Production," supplemented with a seminar on thermodynamics in physical metallurgy, and educational lectures on machining and stress corrosion, the American Society for Metals will also present technical papers covering various metallurgical subjects. The Edward de Mille Campbell Memorial lecture will be delivered by E. H. Dix, Jr., Aluminum Co. of America.

The fourth Metallographic Exhibit will also be held at the show, with micrographic studies of various classifications to be on display at the Public Auditorium for the entire week.

The American Welding Society has scheduled about 80 technical sessions with papers on structural design, pressure vessels, hardfacing and

flame hardening, nonferrous welding, machinery welding, welding apparatus, arcs and electrodes, weldability research, inert gas welding gas cutting, welding of stainless and various welding research and educational topics. An educational lecture series on "Welding Design Fundamentals," will also be presented. The Adams lecture will be delivered by W. M. Wilson, College of Engineering, University of Illinois.

Technical sessions of the Institute of Metals Div., American Institute of Mining and Metallurgical Engineers, will consist of about 60 papers relating to fracture and strain phenomena, powder metallurgy, precipitation and aging, electrical properties of alloys and other metallurgical subjects.

The Society for Non-Destructive Testing program, scheduled for Wednesday and Thursday only, will be highlighted by presentation of the Lester lecture by L. A. Danse of the General Motors Corp.

Correlated Technical Program of National Metal Congress

TECHNICAL programs of the four participating societies have been scheduled in the following manner: The ASM will hold sessions at both the Public Auditorium and the Hotel Statler; the AWS will meet at the Cleveland Hotel, except for the educational lectures which will be held at the Public Auditorium; all of the AIME sessions will be held at the Allerton Hotel; and the Society for Non-Destructive Testing will meet at the Hotel Statler.

Of the four societies, three will sponsor annual banquests, scheduled as follows: ASM—Thursday, Oct. 20, 7:00 p.m., Hotel Statler; AWS—Tuesday, Oct. 18, 8:00 p.m., Cleveland Hotel; AIME—Tuesday, Oct. 18, 7:00 p.m., Allerton Hotel.

Monday, October 17

9:00 A.M.

PRECIPITATION AND AGING

Precipitation Phenomena in the Solid Solution of Nitrogen and Carbon in Alpha Iron below the Eutectoid Temperature, by L. J. Dijkstra, University of Chicago. AIME.

Yielding and Strain-Aging of Nitrided Single Crystals of Iron, by H. Schwartzbart and J. R. Low, Jr., Penn State College. AIME.

Effect of Quenching on the Age Hardening of Two Aluminum Alloys, by R. D. Barer and M. B. Bever, Mass. Institute of Technology. AIME.

Size Effects in Quenching High Purity Precipitation-Hardenable Alloys, by W. L. Finlay, Remington Arms Co., Inc. AIME.

FRACTURE AND STRAIN PHENOMENA

Metallographic Description of Fracture in Impact Specimens of Structural Steel, by M. Baeyertz, W. F. Craig, Jr. and E. S. Bumps, Armour Research Foundation. AIME.

Effect of Ferrite Grain Size on Notch Toughness, by J. M. Hodge, R. D. Manning and H. M. Reichhold, Carnegie-Illinois Steel Corp. AIME.

Investigation of Temper Brittleness in Low Alloy Steels, by S. A. Herres and A. R. Elsea, Battelle Memorial Institute. AIME.

Effects of Molybdenum and Commercial Ranges of Phosphorus on the Toughness of 0.40 Pct Carbon Chromium Steels, by M. Baeyertz, W. F. Craig, Jr. and J. P. Sheehan, Armour Research Foundation. AIME.

RECRYSTALLIZATION

Secondary Recrystallization in Copper, by M. L. Kronberg and F. H. Wilson, American Brass Co. AIME.

Recovery and Recrystallization in Brass, by B. L. Averbach, Mass Institute of Technology. AIME.

Recrystallization Texture and Coarsening Texture in High Purity Aluminum, by P. A. Beck and Hsun Hu, University of Notre Dame. AIME.

Recrystallization and Microstructure of Aluminum Killed Deep Drawing Steel, by R. L. Rickett, U. S. Steel Corp.; S. H. Kalin, Carnegie-Illinois Steel Corp. and J. T. MacKenzie, Jr., U. S. Steel Export Co. AIME.

ALLOY STEELS

9:30 A.M.

Tensile Properties of a Heat Treated Low Alloy Steel at Sub-Zero Temperatures, by E. J. Ripling, Case Institute of Technology. ASM.

Relationship of Inclusion Content and Transverse Ductility of a Chromium-Nickel-Molybdenum Gun Steel, by J. Welchner and G. Hildorf, Timken Roller Bearing Co. ASM.

Effect of Vanadium and Carbon on the Constitution of High Speed Steel, by D. J. Blickwede, Naval Research Laboratory; M. Cohen, Mass. Institute of Technology, and G. A. Roberts, Vanadium-Alloys Steel Co. ASM.

Unnotched Impact Strength of High Speed Steels, by A. H. Grobe and G. A. Roberts, Vanadium-Alloys Steel Co. ASM.

STRUCTURAL DESIGN

Design and Construction of a Modern Welded Deck Girder Highway Bridge, by N. L. Ashton, State University of Iowa. AWS.

Economical Design of Welded Buildings, by Robert E. Robertson, Jr., Saxe, Williar & Robertson, Engineers and Consultants. AWS.

Proposed Design of Welded Rigid Frames for New York Subways, by M. P. Korn, Consulting Engineer. AWS.

Strain Gage Test and Analysis of an

Educational Lectures Feature Metal Congress Program

Seminar on "Thermodynamics in Physical Metallurgy," Saturday, October 15, 9:30 a.m., 2:00 p.m. and 8:00 p.m.; Sunday, October 16, 9:30 a.m. and 2:00 p.m. Hotel Statler. ASM

"Machining—Theory and Practice," Monday and Tuesday, 4:15 p.m. and 8:00 p.m. ASM

"Stress Corrosion in Metals," Wednesday, 4:15 p.m., 5:15 p.m. and 8:00 p.m. ASM

"Design for Welding," H. W. Pierce, N. Y. Shipbuilding Corp., Camden, N. J., Monday, Tuesday and Wednesday afternoon, 4:30 p.m. Public Auditorum. AWS

Eighty-Foot H-Section Welded Truss, by A. Waidelich, The Austin Co. AWS.

PRESSURE VESSELS

Importance of Design in Construction of Tanks and Pressure Vessels, by W. Samans, Pressure Vessel Research Committee. AWS.

Trends in Fabrication by Welding, by S. V. Williams, Struthers-Wells Corp. AWS.

Inert-Gas-Shielded Arc-Welding Aluminum Pressure Vessels, by A. J. Hopper, Welding Engineers, Inc. AWS.

Notch Sensitivity of Mild Steel Plates, by A. B. Bagsar, Sun Oil Co. AWS.

HARD FACING AND FLAME HARDENING

Automatic Electric Hard Facing, by Turner G. Brashear, Jr., Leader Welding and Mfg. Co. AWS.

Hot Hardness of Hard-Facing Alloys, by H. S. Avery, American Brake Shoe Co. AWS.

Hard-Facing Applications in the Steel Industry, by J. J. Barry, Air Reduction Sales Co., AWS.

Flame Hardening of Large Diameter Rounds, by S. Smith, Air Reduction Sales Co. AWS.

2:00 P.M.

EQUILIBRIUM DIAGRAMS

Beryllium - Iron System, by R. J. Teitel, Brookhaven National Laboratories and M. Cohen, Mass. Institute of Technology. AIME.

Ternary System, Copper-Manganese-Zinc, by T. R. Graham, J. R. Long and C. E. Armantrout, U. S. Bureau of Mines. AIME.

Solubility of Titanium in Liquid Magnesium, by K. T. Aust and L. M. Pidgeon, University of Toronto. AIME.

Liquid Solubility of Manganese in a Magnesium-Aluminum-Tin Alloy, by B. J. Nelson and G. F. Sager, Aluminum Co. of America. AIME.

FRACTURE AND STRAIN PHENOMENA

Discontinuous Crack Propagation-Further Studies, by L. D. Jaffe, E.

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Exhibitors at the National Metal Exposition

The following listing identifies the exhibitors participating in the Exposition, scheduled for the entire week at the Public Auditorium. The list tells *who* is exhibiting, *what* is being exhibited and *where* each exhibit is located.

Acme Mfg. Co., Detroit. Booth 826. Grinding, polishing, buffing and deburring machines.

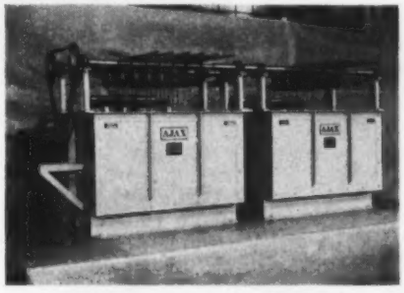
Acme Steel Co., Chicago 8. Booth 1836. Acme-Morrison metal stitchers.

Acme Tool Co., New York 7. Booth 1758. Surface plates; parallels; straightedges; toolholders.

Air-Flo Compressor Co., Akon 7, Ohio. Booth 1750. Air compressors.

Air Reduction Sales Co., New York 17. Booth 2126. Gas welding and cutting equipment; flux-injection cutting equipment; helium welding.

Ajax Electric Co., Philadelphia 23. Booth 1901. Salt bath heat treating and aluminizing furnaces.



Ajax-Hultgren saltbath furnace.

Ajax Electrothermic Corp., Trenton 5, N. J. Both 1901. Induction heating and melting equipment.

Ajax Engineering Corp., Trenton 7, N. J. Booth 1901. Induction melting furnaces.

Allen Manufacturing Co., Hartford 5, Conn. Booth 1615. Hollow set, cap, flat head and shoulder screws; dowel pins; pipe plugs.

Allis-Chalmers Mfg. Co., Milwaukee. Booth 1215. Foundry equipment; electronic induction heating equipment; pumps; electrical controls.

Allison Co., Bridgeport 8, Conn. Booth 2008. Abrasive cutting wheels.

Alloy Engineering and Casting Co., Champaign, Ill. Booth 210. Heat resistant castings; engine, pump and furnace parts.

Aluminum Co. of America, Pittsburgh. Booth 2627. Aluminum in raw and fabricated forms.

American Agile Corp Booth 2519.

American Brake Shoe Co., New York 17. Booth 325. Heat and corrosion resistant castings; cast iron; steel forgings.

American Brass Co., Waterbury 88, Conn. Booth 331. Copper alloy sheet, wire, rod, tubing and other shapes; welding rods.

American Chain & Cable Co., Inc., Bridgeport 2, Conn. Booth 925. (See Campbell Machine Division and Wilson Mechanical Instrument Co.)

American Cyanamid Co., New York 20. Booth 1704. Salt bath heat treating supplies.

American Emblem Co., Utica 1, N. Y. Booth 1809. Nameplates, insignia, emblems, embossed metal stampings.

American Forge Div., Chicago. Booth 325. (See American Brake Shoe Co.)

American Gas Assn., New York 17. Booth 2844. Industial gas applications.

American Gas Furnace Co., Elizabeth, N. J. Booth 2745. Heat treating furnaces; gas burners.

American Machine & Metals, Inc., East Moline, Ill. Booth 1709. (See Riehle Testing Machine Division.)

American Manganese Steel Div., Chicago Heights, Ill. Booth 325. Hard surfacing and reclamation welding products.

American Non-Gran Bronze Co., Berwyn, Pa. Booth 2819. Precision machined aircraft engine and propeller parts; bronze castings; Ni-Resist, cast iron and beryllium machined parts.

American Optical Co., Buffalo 15, N. Y. Booth 1617. Scientific instruments; miscroscopes; comparators.

American Platinum Works, Newark 5, N. J. Booth 2242. Silver brazing alloys and fluxes.

American Pullmax Co., Inc., Chicago 47. Booth 2521. Sheet metal and plate cutting machinery.

American Wheelabrator & Equipment Co., Mishawaka, Ind. Booth 2016. Blast cleaning machines; shotpeening equipment; dust collectors.

Ames Precision Machine Works, Waltham, Mass. Booth 2817. Hardness testers.

Ampco Metal, Inc., Milwaukee 4. Booth 315. Aluminum bronze sand and centrifugal castings; welding electrodes; spot welding electrodes and parts; high conductivity alloys; safety tools.

Anchor Drawn Steel Co. Booth 1401. (See Vanadium-Alloy Steel Co.)

Anker-Holth Mfg. Co., Port Huron, Mich. Booth 2650. Air chucks; collets; air and hydraulic equipment.

Arcos Corp., Philadelphia 43. Booth 1125. Arc welding electrodes; oxy-arc cutting process.

Aronson Machine Co., Arcade, N. Y. Booth 2560. Positioners for welding, spray painting, sandblasting, assembly work and grinding, belt sanders.

Arwood Precision Casting Corp., Brooklyn 1. Booth 2411. Precision investment castings, ferrous and nonferrous.

Aurora Metal Co., Aurora, Ill. Booth 1620. Die castings.

Austenal Laboratories, Inc., New York 16. Booth 931. Microcastings made in high-temperature alloys, low alloys, S.A.E. steels and toolsteels.

Auto Arc-Weld Mfg. Co., Cleveland 4. Booth 2566. Automatic arc welding head and wire.

Turn to Page 250

FEDERAL OFFICIALS AS KEY TO FUTURE

The vital imortance to the working industry's drive for phasized in the comments on ment officials, prepared espe

Congress of the United States
JOINT COMMITTEE ON THE ECONOMIC REPORT

itor
he Iron Age
ew York, N. Y.

Dear Sir:

"Economy in Production" is an altogether appropriate theme for your special issue and for the forthcoming exposition of the National Metal Congress, for the use of metal from the very beginning has resulted in economy of effort on the part of men. The first step forward in the march of civilization was made when our ancestors first began to use metal to produce the things they needed. There is still a long road ahead and much is to be accomplished by the attention which will be focussed upon the problem both by your special issue and by the exposition of the Metal Congress.

By achieving lower costs in work, in time, and in money, "Economy in Production" has continuously raised the standard of living in every age and in every country. The United States has won industrial leadership in the world through improved plant and equipment, for the production and use of machines have been particularly effective here in making economies possible. In times like these, when business is worried about overhead and replacement costs, it is wise to remember that throughout American economic history the cutting edge of technological progress has been cheaper and more efficient machines. They have opened new frontiers of progress because they have promoted economy in production and, thus, in turn, economy in distribution also.

The object of production is distribution, for without an ever-broadening market, production would be futile. That is what makes "Economy in Production" so important. It lowers costs, reduces prices, and increases both profits and wages, thus creating new purchasing power for new markets for more efficient production to serve.

The competitive drive for "Economy in Production" is the first requisite of economic health. It prevents technological stagnation which is the bane of monopoly-ridden businesses. It compels business to adopt new methods. It is the spur to progress. Thus I say, competition and "Economy in Production" go hand in hand to conquer the unlimited frontiers which exist all around us. They are to be found in every shop and factory, on every farm and ranch and, above all, in every dwelling, urban or rural, where American citizens are rearing the next generation.

For all that has been gained in the past by "Economy in Production" much more remains to be achieved in the future.

Sincerely,

Joseph C. O'Mahoney,
Chairman

THE SECRETARY OF COMMERCE
WASHINGTON 25

Dear Sir:

I want to congratulate the National Metal Congress and Exposition for having chosen this year to dramatize "Economy in Production."

Conservation of our natural resources is an important aspect of economy in production. Equally important is the effect of economical production on the American standard of living. If mass production has helped to make us the most prosperous nation in recorded history, it is because the assembly line has provided a great volume of goods at prices which most of us can afford to pay. These benefits have come from the readiness of American manufacturers to accept, from year to year, the newest developments in equipment, machinery and technology. This constant process of modernization has resulted not only in more and better and lower-priced products, but also in increased industrial employment.

As head of the Cabinet Department charged by law with the responsibility for developing and promoting the commerce of the United States, I want to urge every metal working plant in the country to adopt methods that will result in more finished products, at lower prices, with the least expenditure of material.

I am confident that all forward-looking manufacturers will recognize the wisdom of economy in production.

Sincerely yours,

Secretary of Commerce

THE SECRETARY OF DEFENSE
WASHINGTON

Editor
The Iron Age
New York, N. Y.

Dear Sir:

The war demonstrated that in this era, as never before, a country's security can be no greater than its economic and industrial strength. Certainly one of the best ways of promoting economic and industrial health is by eliminating production waste everywhere through the application of scientific research.

The exchange of information about more economical production at the forthcoming National Metal Congress Exposition doubtless will speed technological advancement throughout the whole metalworking industry, thus strengthening our economy and enhancing our security.

The Department of Defense has a real interest in all programs designed to point the way to lower production costs.

Seldom in history has change in military science and concept rendered our arms and materiel obsolete so rapidly. Anything which can be done to reduce the cost of necessary replacements while improving designs means more security for every dollar spent for military items.

The Department of Defense, for example, is greatly interested in production economy based in part, at least, on the use of smaller amounts of critical materials and on designs for lighter arms and equipment without sacrifice of strength or utility. There is no doubt that many of our defense problems can be solved at the same time and by the same means industry employs to solve its problems of production economy.

Sincerely,

SEE PRODUCTIVITY

U. S. WELFARE

nation's welfare of the metal-greater productivity is em-these pages by top govern-cially for IRON AGE readers.

COOPERATION ADMINISTRATION
WASHINGTON 25, D. C.

CABLE ADDRESS
ADECA

Editor
The Iron Age
New York, N. Y.

Dear Sir:

The theme of your special issue "Economy in Production" has unusual significance for the Economic Cooperation Administration since a major phase of our program is the reduction of present production costs in the ECA nations.

High production at low cost is essential if western Europe is to compete effectively in world trade. The first phase of our program, which was to restore production, we feel is well under way. Overall production is already not merely equal but 15 per cent above prewar levels. In Great Britain, it is 50 per cent over the pre-war record. Europe's industrial machine, after being almost wiped out by the war, has been put back together, renewed and strengthened.

Costs, however, are still high and the reasons are not hard to find. Output per man hour in Europe, as compared with America, is low. Through the ECA technical assistance program, the European nations, with our help, are attacking this problem with vigor. Each of the nations has sent and is sending teams including both workers and management personnel to study American production methods. The Anglo-American Productivity Council has, in fact, become a permanent setup.

These teams, I think, have returned home convinced that higher productivity for European industry requires better machines, better methods, and better attitudes on the part of both management and labor. Above all, it requires more horsepower. It is not the versity of the European workers that keeps down European productivity. The Marshall Plan is helping to make available better methods and it is machines; it is helping provide that horsepower and those promoting better attitudes.

The spirit in which American industry--management and labor--has welcomed these teams is making a great contribution toward the success of the recovery program. In my opinion it has, further... much to cement the good feeling between the ERP coun... which is so necessary to ERP's over-all objective, w... ECA Administrator, I want to take this opportunity to... very great personal appreciation of the cooperation o... are giving us in this tremendous but vastly important... us will share in its rewards.

Sincerely yours,

Administrator

THE SECRETARY OF THE INTERIOR
WASHINGTON

The Iron Age
New York, N. Y.

Dear Sir:

Economy in metal production is of greater importance now than at any time in the history of the Nation.

While the metal industries made tremendous progress in research and development during the war, much of our metal resources were expended in achieving victory. New wealth and enlarged opportunities will be created by improved practices, better technical processes and through new adaptations. Much has been done, but the metal industries have the never ending task of making maximum use of expendable resources in the interest of national security and welfare.

We do not want substitutes merely because they are cheaper; we want replacements that are both superior and more economical. The field of alloys is almost infinite in its possibilities. A century of research and development on steel still finds us with plenty to do on the iron-carbon series of alloys. Our knowledge of bronzes and brasses is still incomplete. It is encouraging to note that much research is being conducted on the manganese supply problem and to devise new methods of recovery and utilization.

True economy and conservation are inseparable. I am sure that the National Metals Congress will provide the inspiration for redoubled work in this field so important to our future security and welfare.

Sincerely yours,

Secretary of the Interior

EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL OF ECONOMIC ADVISERS
WASHINGTON 25, D.C.

Editor
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Dear Sir:

I am happy to have this opportunity to wish the greatest success to the National Metal Congress and Exposition, and am gratified that its sponsors have chosen "Economy in Production" as its theme. So much depends upon continued high achievement along this line by American heavy industry.

You may have seen me quoted last spring with reference to the process of "disinflation" and a recent expression of my view that healthy disinflation has not yet been completed. Such completion means simply the full return to vigorous competitive conditions and the successful meeting of the operative and marketing difficulties that keen competition entails. Economy in production is the keynote to success in that effort. I am sure the metal industries will show the world that they have both the intention and the "know-how" to win this battle.

Sincerely yours,

Edwin G. Nourse

Edwin G. Nourse
Chairman

Modern Refractories

SUMMARY: Economies in steelmaking operations are dependent, to a large degree, upon proper application of refractory materials. The suitability of silica, sillimanite, basic and carbon refractories for various uses are appraised by the authors from the standpoint of cost considerations and metallurgical characteristics. Comparative data concerning these refractories and their use in blast furnace construction are presented in this first part of a two-part article.

MANY of the factors which determine refractories costs today differ vastly from those of the postwar period. Virtually all material prices have increased, often in varying amounts; labor rates are generally higher; in some cases the productivity of labor per man hour has increased while in others it has decreased; and various technological advances have been achieved. Consequently, although prewar refractories costs were relatively low, a return to prewar practices would not necessarily result in lower costs. The most economic refractories practices in many cases will be drastically different from former procedures.

The most influential factor that has changed refractories practices from those of the prewar period is the markedly higher cost of bricklaying. Not only have labor rates increased materially, but the number of bricks laid per man hour is substantially reduced. It is increasingly difficult to get bricklayers to make good hot repairs. As a result, more than ever before it is desirable that refractories stay in service for long periods without substantial repairs.

This promotes the use of higher quality and, frequently, more costly refractories which yield long service rather than the less expensive materials which give shorter life. During the war there was a decided trend in this direction because of labor shortage. Now, although labor is available, the trend toward refractories of higher initial cost continues because of the high bricklaying costs.

Another factor which influences operators toward the use of refractories which have long life, but are more expensive, is the increase in the prices of refractory materials which occurred during and after the war. In general, prices of lower cost materials were increased considerably more, percentage-wise, than the higher cost refractories. Thus the use of the higher cost materials, which give long life, has become more economic because of these prices fluctuations alone.

Coincident with the trend toward higher cost materials, there has been, and will be to an even greater degree, a decided trend toward specialization in selecting refractories for specific purposes. Primarily such selection permits balancing repairs in such a way that all the parts of a furnace wear out at one time, and one repair period will suffice rather than several. To achieve such balancing, high quality but more expensive refractories are frequently used in those portions of the furnace subjected to the more severe wearing conditions. This application of special refractories requires close supervision and watching but results have been rewarding.

Many advances have been made in decreasing refractories costs by improving materials handling methods. Various mechanical scoops, shovels, bull-dozers, etc., have materially speeded and decreased the cost of handling bulk materials and refuse. Similarly, in many cases, fork trucks and similar equipment have made handling of skidded brick most economical and labor saving. Increased use of such equipment can be expected in an attempt to bring refractories costs to a minimum.

Another factor that must be considered in evaluating refractories practices is rate of production. While this factor is no longer all-important, it still requires careful consideration. It is true that when a plant is operating only a part of its furnaces, it is not economic to drive for production to the extent that costs are increased. But, if using a different refractories practice permits increased production from the operating furnace at no increase in cost, a decided advantage is obtained.

Fuel cost is related to both production rate and refractories. Though fuel cost is not included in refractories costs calculations, it de-

give new operating economies

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pends directly upon refractories in many cases. Refractories are little more than savers of heat, and other things being equal, the refractory material most resistant to heat flow is the most economic. However, because fuel cost normally decreases as production rate increases, sometimes advantages are derived from a refractory which allows greater heat loss but promotes faster production. Similarly, sometimes it is economic to permit refractories costs to be increased if savings in fuel and increases in production rate are achieved thereby. Considerations of this sort must be resolved for individual cases, since other operating factors also influence them.

Blast Furnace Refractories

Blast furnaces refractories costs represent an extreme example of the relative unimportance of initial material cost compared with the high cost of making repairs. Frequently, in the overall cost of rebuilding a blast furnace, the cost of refractory material is less than 20 pct of the total. As a result, the first cost of the refractories is not as important as the length of service they give. Usually, an overall increase of 20 pct in service life will pay for a doubling of initial refractories material costs. This situation allows a wide price latitude in choosing refractories for the blast furnace.

Probably the most publicized change in blast furnace refractories practices has been the use of carbon as a refractory in hearths or in other sections of a blast furnace. A comparatively large percentage of furnaces built since 1945 have contained carbon refractories in their hearths. Carbon refractories have been manufactured by methods conventional for making electrodes. Large blocks of carbon fitted together in various designs and arrangements have been used, normally in conjunction with carbon paste.

Most carbon hearth installations have included in the bottom, two courses of large carbon blocks forming a layer almost 4 ft thick. Joints as wide as 2 to 3 in. between blocks have not been unusual. This space has been filled with rammed-in carbon paste. Similarly, carbon paste has been used frequently to fill the odd-shaped spaces between the blocks and the hearth jacket. Many installations included carbon blocks hearth walls up to the top of the hearth jacket and some used carbon refractories to the tuyere level. In many cases the inner face of the carbon crucible was covered with fireclay refractories to inhibit oxidation of the carbon during blowing-in. The hearths below the carbon have been of the normally fireclay refractory construction.

During the war the use of carbon received considerable publicity as the hoped-for remedy for salamander formation and hearth break-outs in blast furnaces. Many blast furnace operators accepted this view and for a time considered it the panacea for all blast furnace hearth troubles. There were many extremely favorable reports on the use of carbon during the war years, but more recently, in the last 2 years, a series of break-outs in furnaces with carbon hearths has shown that carbon is not the "perfect" blast furnace hearth refractory under all conditions.

While it has many advantages as a hearth refractory, being chemically inert to action by the metal and slag, having a marked volume stability and having a high thermal conductivity which, with proper installation, permits better control of cooling, carbon is particularly vulnerable to oxidation from air blast, moisture, or other sources of oxygen. Carbon does not eliminate break-outs completely nor does it stop the formation of a salamander. Though many carbon hearths were installed as insurance against such occurences, the contemporary evidence does not support this as a valid reason for using carbon.

The economy of a carbon hearth is still being studied. Since the first cost of a carbon hearth is approximately half the cost of an entire fireclay lining, the use of a carbon hearth represents an increase in lining material cost of approximately 50 pct. Such an increase would not be difficult to justify if overall lining life were improved as much as 10 pct; to date, however, there is no proof that carbon hearths provide this 10 pct improvement. Existing furnaces with carbon hearths must be operated and observed more extensively before reliable cost data can be established.

Just before the advent of the carbon hearth, another new hearth refractory was tried in several furnaces. This material was sillimanite ramming mix installed in a monolithic pad in the bottom of the furnace. Rammed sillimanite pads have been installed in blast furnace hearths in two different ways. In the first instance a layer of sillimanite from 3 to 9 in. thick was formed on the top surface of the hearth. Situated thus, the sillimanite pad bears the brunt of blowing-in of the furnace and protects the brick hearth. The alternative and preferred construction places a layer of sillimanite from 9 to 13½ in. thick about two courses of bottom blocks below the top surface of the hearth and extending out to the hearth jacket. Placed in this position, the sillimanite pad is burned into a dense, extremely refractory monolithic layer which inhibits the formation of a large salamander. Operating furnaces including such installations in their hearths have shown evidence of "high" bottoms for long periods after blowing-in.

At least 15 blast furnaces have had sillimanite pad installations in their hearths from 1937 through 1946. Other furnaces have had hearth patches of sillimanite ramming mix after hearth break-outs. None of these furnaces has had any appreciable hearth troubles and all have had creditable records. The first installation had a campaign of over 2.5 million tons, leaving a salamander of only 780 tons. Other furnaces have had campaigns of from slightly under 1 million to over 2.5 million tons and are still going strong.

The cost of sillimanite pads in blast furnace hearths is not high. In most cases about 20 tons of sillimanite ramming mix are used, representing an increase in materials costs of about $2000 to $2500 per furnace or less than 5 pct of total refractories cost.

Another use for sillimanite ramming mix in blast furnace hearths is in conjunction with carbon blocks. The sillimanite ramming mix can be rammed between the hearth staves and the carbon blocks as a hard setting refractory material that will replace carbon paste, which has been known to become granular in this location. Installations of this sort have been tried in one or two furnaces recently and further investigation of such practice is expected.

Sillimanite refractories in the form of brick have also been recommended for trial in the hearth walls and particularly around the iron notch of blast furnaces. Sillimanite brick are more refractory, more volume stable and more resistant to corrosion by blast furnace slag than fireclay blast furnace brick. Carbon brick have experienced most of their difficulties in the tap hole section and it is probable sillimanite brick would render improved service

Fig. 1—Battery of hydraulic presses producing steel-plated bricks.

in this application, at somewhat less than the cost of carbon.

Sillimanite refractories have also proved economic and advantageous in sillimanite mortar for laying-up the hearth and bosh sections of blast furnaces. At one large steel plant sillimanite mortar used throughout the entire lining, has yielded excellent results. Many plants have used sillimanite mortar in the hearth and bosh sections with improved results. Sillimanite mortar, like other sillimanite products, is highly refractory, volume stable and resistant to slag action, making it preferred over standard fireclay mortars. Moreover, sillimanite mortar does not catalyze the reaction which results in carbon deposition in blast furnace stack linings. This explains its superiority over ordinary fireclay in the stack section of blast furnaces.

Sillimanite Costs Justified

The cost of using sillimanite mortar in the hearth and bosh sections of a blast furnace is approximately $5000 per furnace, less than 10 pct of the lining materials cost. Operators who have used this material believe the cost is well warranted.

Trends in developing blast furnace refractories are shown by the changes made. Most important is the development of brick strongly resistant to carbon disintegration. Such brick also have high density and low porosity. Improvements in these directions have increased brick manufacturing costs and have resulted in increases in sales price. These increases in initial cost have been considered justified by the operators using the improved brick. Although relatively few furnaces with improved fireclay refractories have completed their campaigns, it appears almost certain that lowered overall blast furnace refractories costs will result from their use.

For best resistance to carbon disintegration the brick must be fired to a very high temperature so that all of the iron oxide content of the brick is chemically combined as a silicate. Usually these special brick are called high-fired blast furnace brick. Their use will cause lining first cost to be about one and one-half times that of regular fireclay refractories for the sections involved. Most common usage is throughout the stack section above the mantle, although occasionally, they have been used throughout the lining.

Blast furnace operators who have experienced trouble from carbon disintegration and have since used high-fired brick have found that the use of the more expensive high-fired brick is decidedly more economical. Hot spots from carbon disintegration have been virtually eliminated and lining life has been increased.

Blast furnace stoves are another example of material costs being of less importance than the length of service they render. Blast furnace stoves must stay in operation for many years, and trouble-free operation throughout stove life justifies increases in materials costs, particularly in materials for those parts of a stove which are subjected to most severe wear. These are the combustion well, the dome and the top quarter of the checker setting.

With the development of high-fired blast furnace brick, a new refractory especially suited to use in these portions of blast furnace stoves, is also made available. High-fired blast furnace brick have low porosity, low permeability and high mechanical strength, which makes them strongly resistant to attack by alkalies. Alkali attack is a frequent cause of failure in blast furnace stove checkers. The new brick also are more resistant to deformation under load and to reheat shrinkage than are standard fireclay stove brick, and consequently are well suited for combustion well walls and domes.

In the top quarter of the checker setting, alkalies are frequently deposited from the combustion products of the stove fuel. These alkalies can react with the checker brick in one of two different ways: (1) If temperature of the stove is sufficiently high, the alkalies will act as a flux and the brick will melt and run—this happens more often with highly siliceous fireclay brick; and (2) if temperature of the stove is not high enough to cause fluxing, soda present in the alkalies will penetrate the pores of the brick and react with the brick material to form the mineral, nephelite, with a resultant expansion. This reaction causes the brick to shell or peel away in layers. Not only are the brick themselves destroyed but also the pieces which fall away are apt to plug the openings in the checker setting. Most trouble from alkalies in blast furnace stoves is the result of latter reaction.

Brick which will resist such attack must be of low porosity and permeability to inhibit penetration by alkalies. They also must be mechanically strong to resist the stresses set up by the formation of nephelite. These characteristics are the primary attributes of high-fired fireclay brick.

At present no stoves have been built using high fired brick, but trials of this material will be made in the near future. Such trials will be more expensive in first cost but it can be expected that with the increase in stove life and the decrease in required repairs which will result, the use of high-fired brick in blast furnace stoves will be advantageous in the overall economy.

In the next issue the authors will evaluate application of various refractories to openhearth furnaces and mixers and soaking pits.—Ed.

PRECISION HARDENING HIGH SPEED TOOL STEELS

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SUMMARY: Bright hardening of high-speed tools, with complete absence of carburization and decarburization, is possible in the L-shaped furnace, accompanied by significant production cost savings. A description of the construction and operational features of this controlled atmosphere unit is presented in this first part of a two-part article. Concepts concerning theory and application of atmospheres for precision hardening are also discussed.

HARDENING of high-speed tool steels totally free from scale, decarburization, or carburization, has always been, because of the high temperatures involved, a difficult problem. By ignoring past traditions of furnace design and metallurgical concepts of quenching, high-speed tools can now not only be hardened scale-free, but also practically bright and totally free from decarburization or carburization with the retention of the finest and keenest cutting edges. Precision hardening of high-speed steels has been done in the past on a very limited scale under close supervision of laboratory technicians. Even repeated gas or salt bath analyses would not insure consistent results.

A new process for precision, bright, hardening of high-speed tool steels involves new concepts of furnace design to keep the "controlled" atmosphere under control. More than 3 years' research was spent before a final design was developed to obtain the full capabilities of protective atmosphere treating of high-speed steels.

The furnace associated with this process is unique in construction as compared with conventional preheat and high heat furnaces of the past. It consists of preheat, high heat and quench all built into one complete unit as shown in figs. 1, 2 and 3 (patent applied for).

An unusual feature of the design is that the preheat is built at a right angle to the high heat. The quench unit follows directly behind the high heat unit, and is designed to quench the steel by means of forced convection, cooled, protective atmosphere. Sections of high-speed steel up to 2½ in. can be fully hardened by the atmosphere quench. Since the steel does not contact the air until after

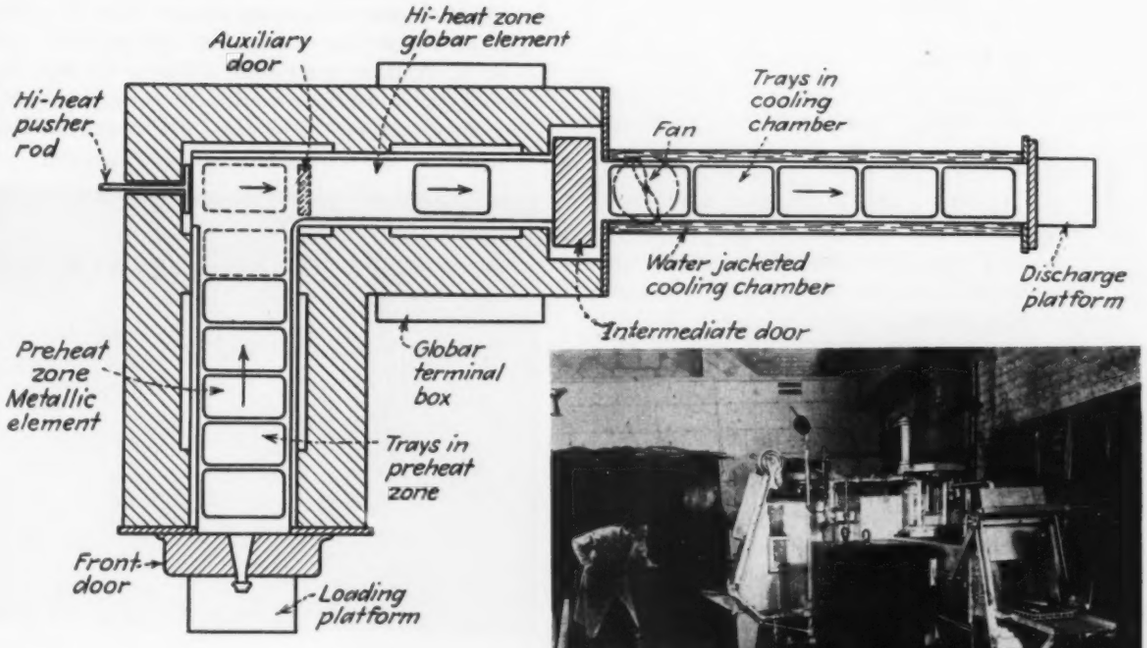


FIG. 1 — Cross-sectional top view of L-type hardening furnace showing constructional features and flow of work through furnace.

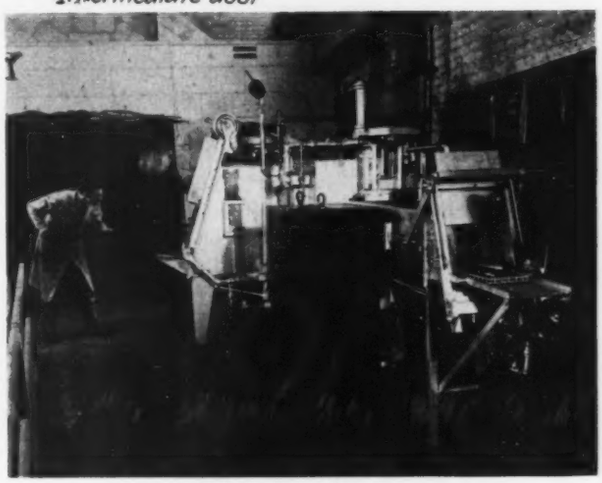


FIG. 2—L-type precision high-speed tool steel hardening furnace showing method of charging tray of work into furnace. Discharge door is opened (normally closed in charging) to pass tray of quenched steel.

the preheat, hardening and quench cycle is completed, bright products, free from decarburization or carburization can be obtained.

As can be observed in figs. 1, 2 and 3, the combined preheat-high heat-quench, L-shaped furnace, has loading and unloading tables at each end for handling trays of tools. Automatically operated flame curtains ignite when either door is opened, to prevent infiltration of air. The charging door is operated by an air cylinder actuated by a foot air-valve, allowing both hands of the operator free for charging the trays of tools. Both charging and discharging doors ride on a slanted, heavy steel, ground plate, to form a sliding seal, so that the door need only be opened enough to pass the tray of work. This feature aids in conserving the protective atmosphere and holds contamination to a minimum.

A deep vestibule of much smaller cross-sectional area than that of the preheat zone follows the charging door for the purpose of trapping contaminating curtain gases. A bleed-off pipe is attached to the vestibule to purge out infiltration and burn off the escaping protective atmosphere.

The heating elements in the preheat zone are of the rod, overbend, metallic type composed of 80 Ni-20 Cr, rated for 2000°F max operating temperature. These heating elements can be easily removed through the charging door for maintenance purposes. Temperature of the preheat zone is automatically controlled by a separate pyrometer in conjunction with a relay contactor, and transformer. Hearth plates throughout the preheat and high heat zones are of the nonmetallic type, composed of silicon carbide which will not warp or melt in the high heat zone, but yet provide excellent heat transfer.

The entire work hearth in the high heat zone can be easily viewed at all times through a large 2-in. Vicor glass peephole at the transfer station, as shown in fig. 3. A built-in pusher bar is used at this station to transfer trays from preheat to high heat to quench chamber.

The heating elements in the high heat zone are of the nonmetallic, silicon carbide, Globar type, rated for a maximum operating temperature of 2500°F. These heating elements can easily be removed for maintenance, even while the furnace is hot. The temperature in the high heat zone is also separately and automatically controlled by means of a pyrometer working in conjunction with a relay, contactor and transformer. A multiplicity of protective atmosphere inlets are provided under the hearth and in the top of the furnace in the high heat zone to thoroughly and constantly purge

all portions of this zone where it is extremely important to keep the protective atmosphere at its best. The protective atmosphere is then expelled through the preheat and quench zones.

A heavily insulated door, operated by an air cylinder, separates the high heat zone from the quench zone. This door is actuated by hand valves from either the pusher station or at the discharge station. The quench chamber consists of a water-jacketed cooling chamber with automatic water temperature control and a motorized fan to force cold, protective atmosphere over the hot load of work until the steel is below its critical hardening temperature. The hot charge of work coming from the high heat zone is therefore cooled by forced convection of cooled protective atmosphere, by conduction through the water-cooled hearth plate and by radiation from the water-cooled sides and top of the quench chamber. If for some reason it is desirable to oil, salt or lead quench the high-speed steel, this can be done by merely pulling the tray of work through the quench chamber and discharge door, and then quench in the conventional manner.

Cycle and Operation

Tools to be hardened progress through the furnace in trays. The preheat furnace holds five trays, the high heat one tray and the quench chamber five trays. The reason is that the preheat cycle requires four to five times the high heat cycle and the quenching and subsequent cooling cycle requires four to five times the high heat cycle in order to cool the work below 350°F, so that discoloration will not take place when tools are removed from the quench and cooling chamber. As noted in fig. 1, the width of the trays in the preheat zone becomes the length of the tray in the high heat and quench zones.

In operation a tray of tools is placed in the vestibule of the preheat zone just inside the charging door. The high heat zone determines the cycle of charging and discharging work. As in the operation of any conventional high speed furnace, the operator must observe when the color of the steel matches the color of the furnace and then allow for a soak period. For example, a tray of pieces of 18-4-1 high-speed steel, 2 in. in cross section, would require approximately 7 min to reach 2350°F in the high heat zone after being preheated. The normal time allowed for the soaking period would be 3 min and the cycle would therefore be 10 min. If approximately the same number of pieces were repeatedly placed on the tray, it would not be necessary for the operator to judge the cycle each time.

It will be shown later by test data that the cycle in the high heat zone is not too critical with this precision atmosphere process, provided the operator allows enough time for the tool to reach the hardening temperature. A soak of from two to four times normally required by a section would cause no damage. The only loss would be the loss in production capacity of the furnace.

FIG. 3—L-type hardening furnace showing method of transferring tray of work from preheat into high heat and quench without the work contacting air.

If the cycle should be 10 min, then at the end of every 10 min the operator would, by means of the built-in pusher rod, push a tray of work from the high heat zone into the quench zone, after opening the intermediate door from the pusher station (see fig. 3). The operator would then open the charge door and push the last tray to the transfer station which is directly in line with the high heat zone. Another tray would be charged into the preheat zone by pushing all trays one step forward. The front door would then be closed, and the operator would go to the pusher station, charge the preheated tray into the high heat zone, then remove a tray from the quench chamber to make room for the next quench.

The L-shaped high-speed steel furnace has been designed in three standard sizes. The smallest size unit utilizes a tray 5 x 7 in. with a working height of 5 in. and is rated to harden and quench 40 to 50 lb of high-speed steel per hr. The middle size, utilizing a tray 9 x 14 in. with a working height of 10 in. and rated from 90 to 120 lb per hr, has been found to be the most desirable for the average tool room. This size, shown in figs. 1 and 3, is the size used on all test and metallurgical data given in this article. The largest size unit utilizes trays 11 x 17 in. with a working height of 12 in. and is rated for 150 to 180 lb per hr.

These tray sizes and maximum working heights represent, in each case, the largest size tools that can be processed through the combined preheat, high heat and quench units. When the preheat is to be used alone for hardening water and oil hardening tool and die

steels, much larger size tools can be handled. The small size unit will handle tools up to 8 in. wide x 13 in. long x 5 in. high, the medium size up to 15 in. wide x 24 in. long x 10 in. high and the large size up 18 in. wide x 36 in. long x 12 in. high.

The L-shaped furnace was designed to precision harden drills, form cutters, chasers, reamers, milling cutters, etc., as shown in fig. 4, rather than to harden long, high-speed steel broaches. Such tools are best handled in a special, vertical atmosphere furnace designed to harden the long broaches suspended from a fixture vertically, to minimize warping.

The L-furnace is not limited, however, to the hardening of high-speed tool steels. It is ideally suited to harden high carbon-high chromium tool steels or any other types of tool steels having air hardening characteristics. The same advantages and economies of the L-shaped unit apply to these types of steels as to the high-speed steels. The preheat section is designed to harden any of the oil or water hardening tool and die steels and can be used separately for this purpose. Furthermore, the L-furnace can be used for bright copper brazing, silver brazing and annealing. Case hardening operations, such as dry cyaniding, can also be achieved by merely adding approximately $150 worth of flow gages and valves for adding ammonia and a hydrocarbon gas (natural or propane) to the basic protective atmosphere from the generator.

Such versatility means a great deal to small companies whose tool and production requirements do not justify buying separate units for tool and die hardening, high-speed tool hardening, brazing and case hardening. The L-shaped furnace is, therefore, an all purpose tool room furnace to take the place of separate preheat and high heat furnaces and to produce results and economies impossible to achieve by separate atmosphere units. Since this article is intended to cover only the precision hardening of high-speed tool steels, test data showing results of other applications of the furnace have not been included.

The initial cost of a complete L-furnace and atmosphere generator is approximately the same as the conventional separate preheat and high heat furnaces as an equivalent size, with an atmosphere generator. If the generator is omitted, however, the L-furnace will cost somewhat more than the separate preheat and high heat furnaces because of the added quench unit. Since the generator capacity for the L-furnace need only be one-half the capacity of the generator used on separate preheat and high furnaces, the difference in saving makes the L-furnace and conventional furnace installations comparable. If the installation is to be used primarily for high speed hardening, the L-furnace installation will not require oil or salt quenching equipment, washing equipment, or sandblasting equipment, and a considerable saving in initial cost is realized.

If floor space is at a premium, the L-furnace offers still greater savings, including (1) increase in tool life, (2) elimination of grinding and costly finishing operations, loss of tools due to breakage in hardening and washing and cleaning operations, (3) reduction in maintenance and power costs, (4) flexibility in permitting complete shutdown when desired.

The unit is designed from the point of view of keeping the protective atmosphere under control in the furnace at all times by reducing infiltration of air and curtain gases to a minimum while charging, quenching, and discharging tools. Factors which have prevented full control of the protective atmosphere and the full capabilities and benefits of a protective atmosphere in conventional separate preheat and high heat furnaces can briefly be summarized as follows:

(1) Scaling of work when removed from pre-

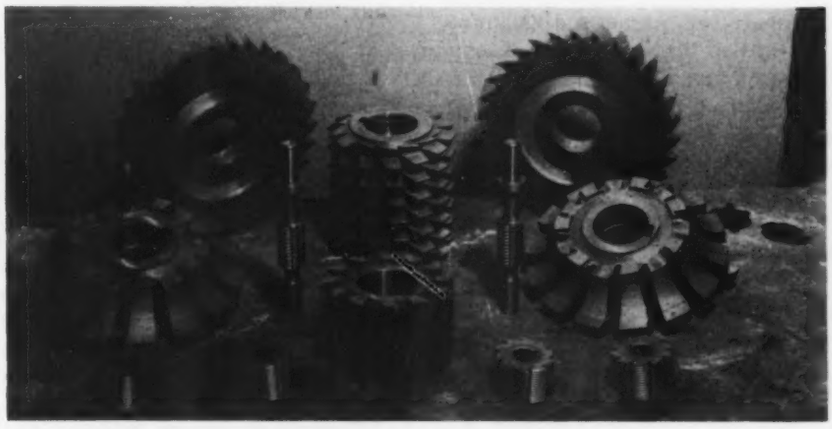


FIG. 4—Typical high-speed tools and cutters ideally suited for heat treatment in the L-type furnace.

heat into air and transferred to high heat. Subsequent reduction of the scale in the high heat furnace resulted in decarburization or a tendency towards decarburization.

(2) Contamination of the high atmosphere when opening the charging door. The degree of damage done depended upon the type of reducing atmosphere and the flow used.

(3) Scaling and slightly decarburizing the steel when removing from furnace through air

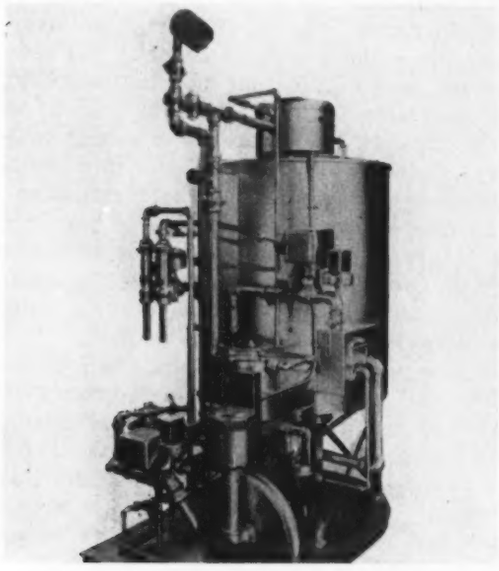


FIG. 5—Lindberg precision high temperature endothermic generator, 750 cu ft per hr, used to supply protective atmosphere to the L-type furnace.

to the quench. The full benefits of a scale-free atmosphere were lost at this point.

Atmosphere Requirements

Two types of generating processes have been developed to produce atmospheres for the precision hardening of high speed and other types of tool and die steels. The first, and the most popular today, is the high temperature endothermic (Hyen) cracking process. It operates on fuel gas, is fully automatic in operation, is lower in cost of operation, and contains automatic safety features. The second, the one used for years before the development of the high temperature endothermic cracking process, is the charcoal (Hyco) generator which burns a special charcoal with air to produce the atmosphere.

The most important constituents to be controlled are the oxygen, carbon dioxide, water vapor and methane. Carbon monoxide, hydrogen and nitrogen will vary, depending upon type of fuel used. For example, if natural gas is used in the high temperature endothermic cracking process, the hydrogen will be approximately 40 pct, the carbon monoxide 20 pct, nitrogen 39 pct, and methane 1.0 pct. If propane was used as a fuel, the analyses would change to 33.5 pct H_2, 24.5 pct CO, 39 pct N_2 and 1.0 pct CH_4. This is due to the relative amounts of carbon and hydrogen in the fuels being cracked. Charcoal contains practically 100 pct C, and therefore, in the charcoal generating process, the resulting analysis will be high in carbon monoxide (33.5 pct), high in nitrogen (61 pct), but low in hydrogen (5 pct).

Carbon monoxide and hydrogen are the reducing gases that keep the steel bright and are neutral to the steel provided the proper relationship is maintained between the decarburizing constituents, carbon dioxide and water vapor, and the carburizing constituent, methane. If the hydrogen content of the atmosphere is high, as in the case of the endothermic process, then the carbon dioxide constituent must be completely eliminated. Oxygen content must, of course, be zero in any bright hardening atmosphere.

The carburizing constituent (methane) cannot, however, be permitted to exceed 2.0 pct at the high-speed steel hardening temperatures. If this limit is exceeded, carbon will precipitate and cause pitting of the steel by localized melting where the carbon specks alight. Therefore, since the carburizing constituent (methane) cannot exceed 2.0 pct; the decarburizing constituent (water vapor) must be held within very narrow limits.

Research studies at the Lindberg Engineering Co. some years ago revealed that a temperature of 2200°F was required to maintain perfect control over the endothermic gas cracking process. Since this temperature was too high for alloy, the refractory type, silicon carbide, endothermic cracking retort was developed. In order to obtain perfect control over the process, automatic precision mixing machines and carburetors, together with automatic pressure and flow control, were incorporated into the atmosphere generator to maintain constant air-gas ratios. A modern high temperature generator is shown in fig. 5.

With control over temperature, mixing, pressure, and flow in the endothermic atmosphere generator, the only other variable is the raw gas supply itself. Natural gas is the most ideal fuel to use for cracking in the generator because of its consistency in analysis. Some types of manufactured (city) gas can be used, but these require more frequent checking because the analysis of a manufactured gas is subject to change without notice. If natural gas is not available, then it would be much better to substitute propane as the fuel when dew point readings of the protective atmosphere must be held low and within narrow limits. The propane must be of the type obtained from stripping natural gas and not the type that is a by-product from the petroleum industry.

Metallurgical results obtained with the L-shaped furnace will be discussed in the concluding part of this two-part article. Data relating to bright tempering will also be presented.—Ed.

Economies of

Short-Run Stamping Practice

By O. T. ANDERSEN, President, and J. M. ANDERSEN, Chief Engineer, Duplicon Co., Inc., Hopkinton, Mass.

STAMPING, while a precision method of producing metal parts, is normally a high cost operation where the total number of parts required is low. The costs of designing and making stamping dies for shaping metal parts are the primary deterring factors in the use of the method, unless production requirements are sufficiently high to offset these initial costs. Yet there is frequently a need for a limited number of stamped metal parts, especially when a product is subject to change in design or where a new product is being introduced and limited quantities must be made to test its marketability.

Development of a die-manufacturing technique that is low in cost, yet completely serviceable on short production runs, has placed stampings within the reach of manufacturers from a cost standpoint. This technique permits the use of stampings where otherwise castings or forgings might be specified.

The scope of short-run stamping practice is primarily for production of stampings up to quantities of 10,000 pieces. It affects a quick delivery so that preliminary market tests can be made of products. One hundred stampings can be produced at the cost of a few handmade samples. Actual stampings are more desirable than handmade parts because of special characteristics that produced parts possess, such as the break of the metal on the edge of the burr.

Accuracy of stampings produced is equivalent to that obtained from the most expensive conventional dies. Setup costs for reorders with this system are exceptionally low, and dies can be stored in very little space. Stampings can be made to extremely close tolerances, and it is possible to produce commercially flat blanks without spread, even though the stamping has margins narrower than thickness of the stock. Operations such as punching, bending, forming, embossing, drawing, or combinations of these, can be readily performed.

Different suppliers of short-run stampings have various equipment and capabilities, but as a rule almost any part that can be stamped from a 12x12 in. piece of sheet metal up to ¼ in. thick can be made on a short-run basis. This rule includes any material that can be punched

SUMMARY: Marked cost savings obtained in producing limited quantities of stamped parts by short-run stamping practice make this low-cost method particularly interesting when making design changes, proving tool setups and in testing the market for a product. Factors that must be considered in the application of this technique are discussed and cost data comparing it with other manufacturing methods are presented.

by conventional dies, such as hot or cold rolled steel, stainless steel, aluminum, brass, copper and certain types of plastic and rubber sheet. Furthermore, if the parts are small, they can be made of thicker material, up to ⅜ in.

Bends and holes are formed as easily as in more expensive standard die design methods and at substantial savings. Forming operations are relatively expensive, as in conventional stamping.

By techniques worked out in short-run stamping plants, blanking dies for special shapes cost from $20 to $80 each, with 90 pct of them costing less than $40. Costs will vary as to tolerances, size, complexity and material to be blanked, and, except in unusual pieces, hole punching and bending tools do not amount to half as much as the blanking dies cost.

Die life, while difficult to determine, is relatively good. A blanking and hole punching setup can make 10,000 to 15,000 parts of ⅛-in. thick steel without difficulty.

As production requirements increase, cost of manufacture by conventional die methods will more nearly approximate the cost of production by short-run dies. Table I is an excellent example of this fact. As can be seen from the data in the table, in manufacturing up to 10,000 pieces, the cost definitely favors short-run stamping methods because of low die cost, but for 10,000 pieces and over, costs favor standard die design.

The same general situation exists in the use of castings instead of stampings. The short-run stamping technique is comparable to the "pine pattern" method used in foundries to make a few pieces of a certain shape. However, even by this casting technique, it frequently pays to compare costs between cast parts of a design that could be adapted to stamping, despite the fact that the casting method used is primarily for small quantities. Consideration should also be given to improved finish, predictable ultimate and yield strengths, elimination of machining, and accuracy of contour and hole location, factors that favor the stamped part.

Table II shows cost data on a bracket that was stamped from steel and one that was made of cast iron. The savings, in the manufacture of 200 pieces, were in production and tool costs. For 200 stamped parts, total cost of manufacturing was $15.20, while for 200 cast parts the total cost was $51.68. On longer runs, the economies of stamping are more evident.

Several considerations should be taken into account in designing stamped parts where costs

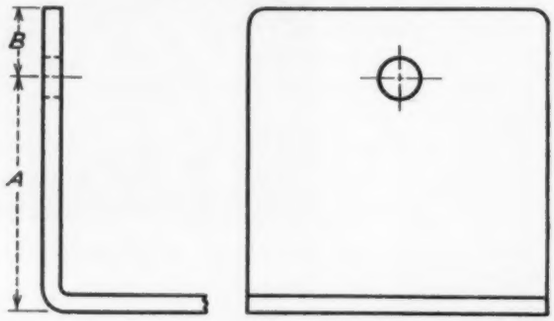


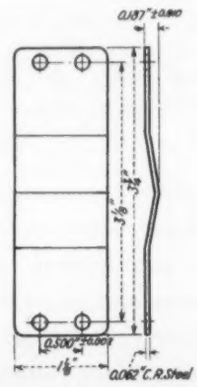
FIG. 1—Tolerances on dimensions that locate holes in parts affect the cost because they determine if holes are to be punched before or after bend is made. Holes located close to a bend may be distorted by the bending operation.

are to be kept as low as possible. Tolerances should be stated on all drawings to insure desired accuracy without spending money for work not necessary. Tolerances should be no more rigid than necessary, because it is axiomatic that costs increase as tolerances on dimensions become more exacting. Dimensions of outer contour of the blank can be held, with a minimum of cost, to 1/64 in., on dimensions under 12 in. Round hole diameters and dimensions between holes can be held to ±0.002 in. with no difficulty. More accurate contours on the blank, hole diam-

TABLE I

Part Cost Comparison, Short-Run v. Standard Progressive Die Setups

Short-Run Die Method		
Die Cost		$58.00
Setup Cost		$ 3.50
Cost per piece in lots of:		
100	$0.067	
500	0.06	
1000 to 5000	0.052	
5000 or more	0.046	
Total cost for:		
100 pieces		$68.20
1000 pieces		113.50
5000 pieces		298.20
10,000 pieces		528.20
Standard Design, Progressive Die Setup		
Die Cost	$300	
Cost per piece in lots of 10,000 to 50,000	$0.016	
Total cost for:		
100 pieces		$301.16 min
500 pieces		316.00 min
1000 pieces		380.00
10,000 pieces		460.00



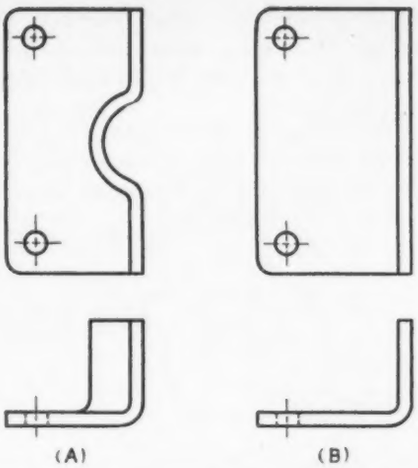


FIG. 2—Formed pieces, parts that contain a bend line that is not straight, are relatively expensive. Part A is formed, whereas part B has a straight bend. While A is more expensive, it is obviously more rigid, and frequently the added cost is inconsequential.

eters and hole locations can be held, but greater accuracy increases die costs, and, in turn, increases final cost of the part.

Tolerances on stock material, temper and thickness should also be stated. Since the supplier of stampings frequently has no idea of how the parts will be used, the tolerances on material are necessary so that a part will be supplied that will be exactly as desired. Close tolerances on materials may cause delivery delays and unwarranted expense, and should be avoided wherever possible.

Consideration must be given to final use of the part. The purchaser of stampings must consider that stampings have one round edge and one burr edge, and if this fact makes any difference in final assembly, drawings should be marked "Round Edge Up" or "Round Edge Down." Since the piece can be blanked from either side, there is nothing added to the cost of a part to have the rounded edge where it is most desirable.

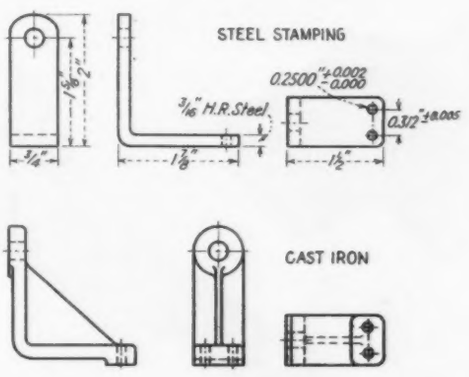
When holes are located in a bent piece, tolerances on the dimensions that locate the holes become important. These tolerances determine whether the holes are punched before or after the bend is made in the piece. Holes located close to a bend may be distorted by the bending operation. Typical of this consideration is the drawing shown in fig. 1. If dimension *A* is ±1/64 in., the hole can be punched before bending, but if *A* is ±0.002 in., the hole will have to be punched after bending. A ±0.002-in. tolerance on dimension *B* will cause no difficulty, assuming that a tolerance of about 1/64 in. can be

FIG. 3—A typical formed part. Tooling for stamping this job cost $168, setup cost was $4, and the run was 1300 pieces. Exclusive of material, the cost per part for 1300 pieces was 3½¢.

TABLE II

Comparison of Costs of Short-Run Stampings v. Cast Iron, Based on Production of 200 Pieces

Short-Run Die Method		
Dies:		
Blanking, hole punching and bending		$42.00
Manufacturing costs:		
Setup		3.00
Material cost per piece	$0.016	
Labor cost per piece	0.060	
	0.076	
Material and labor cost (200 pieces)		15.20
Total cost		$60.20
The next 200 pieces, using above figures would cost $0.091 each, including material and setup.		
Pine Pattern Cast Iron		
Tools:		
Single pine pattern		$ 15.00
Drill jig		35.00
Manufacturing costs:		
Cost per casting @ 18¢/lb	$0.0684	
Milling, including setup	0.12	
Drill three holes	0.07	
	0.2584	
Material and labor costs (200 pieces)		51.68
Total cost		$101.68
The next 200 pieces, using above data, would cost $0.274 each, including material.		



allowed on the total length of leg $A + B$. Holes punched after bending mean a higher die cost and a resultant increase in cost per piece.

Formed pieces are usually relatively expensive. A formed piece is one that contains a bend line that is not straight, whereas bent pieces are those that have straight line bends. In figs. 2, piece (A) is formed, while piece (B) is bent. Part (A) is obviously more rigid than part (B), and frequently the additional cost is therefore worthwhile. Such a part is shown in fig. 3, together with cost data.

There are exceptions to the general rule that forming is expensive, the chief of which is illustrated by the part shown in fig. 4. If the forming dies can be easily made on a lathe, the forming may be quite inexpensive.

Another consideration in the use of short-run stampings is in hole size. Holes with diameters less than thickness of the stocks are usually drilled to avoid excessive punch breakage and consequently increase the cost per piece. In most stampings, corners are rounded to minimize punch and die breakage. A 1/32 or 1/16-in. radius is usually adequate. Where sharp corners are required, special methods that often require second operations are employed.

Other examples of short-run stamped parts are shown in fig. 5. These include straight blanked parts as well as bent and formed parts, both with and without holes and with insets cut into the material. Parts A, B and D are steel and C is brass, and they vary in thickness from 1/16 to 3/16 in. Cost data for these specific parts is given in Table III.

Even though conventional, high production tools can be economically utilized in meeting the demand for stamped parts on a production basis, the preliminary use of temporary tooling has been found to be good insurance. It protects the manufacturer against expensive errors in design and against even more expensive errors in estimating potential sales. Further, short-run tooling provides a quick and inexpensive method of changing a part design when improvements are discovered.

Short-run tooling is also beneficial in the manufacture of parts of special size or for special purposes which would be otherwise too expensive. Fixed wrenches for individual machines and hardware to meet unusual requirements or provide unusual appearance are typical of such uses. Manufacturers of advertising displays, agricultural equipment, air conditioning equipment, automotive supplies, business machines, cameras, drawing implements, radio parts, scientific apparatus, toys and other similar items have used, and are using, short-run tooling for the production of a limited number of stampings. The economies of the practice are self-evident, and the technique is one that should be investigated by all metal fabricators.

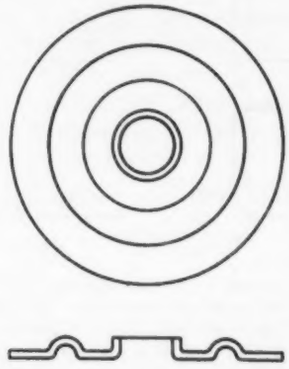


FIG. 4—If forming dies can be easily turned on a lathe, a formed part, of the general design shown, may be quite inexpensive.

TABLE III

Production Costs for Short-Run Stampings shown in Fig. 5

Material	A Steel	B Steel	C Brass	D Steel
Tools	$162.00	$37.50	$130.00	$47.00
Setup	$ 8.00	$ 3.00	$ 9.00	$ 3.00
Total run	500	1100	400	500
Cost per piece, including material	17¢	11¢	18¢	7¾¢

FIG. 5—These typical short-run stampings are shown in the order referred to in table III. Tool and setup cost and cost per part are shown in table III.

AN ENGINEER'S NOTEBOOK OF

COST SAVING IDEAS

A collection of practical cost saving ideas for the metal-working industry is presented herewith. These ideas are typical of the production economies that can be obtained through the use of modern methods and equipment.

SUBJECT:

Lime coat drying and dehydrogenizing of steel wire and rod prior to drawing.

PROBLEM:

To increase production rate. Processing in tunnel or batch type baking units requires up to 2 hr.

RECOMMENDATIONS:

Suggest use of "Hi-Speed" rod bakers because of much faster baking and handling characteristics and space, fuel and labor savings. These bakers can be heated with gas, oil or in combination, electric heat and steam, or any other fuel.

SAVINGS:

Drying, baking and dehydrogenizing operation takes from 3 to 15 min per pin; blow-off system at bottom of baker results in a 40 to 50 pct fuel saving.

Data courtesy Carl Mayer Corp., Cleveland

SUBJECT:

Bearings for induction motor driving source for 14 cotton spinning frames in a textile mill.

PROBLEM:

Power consumption, using fifteen 2 3/16 and 2 7/16 grease oiling cast iron bearings, is rather high, and oil dripping sometimes causes spoilage of goods.

RECOMMENDATIONS:

Use ball bearings. Power consumption is less, lubrication cost is reduced, bearings are clean with no dripping of oil and consequent spoilage of goods and there is less strain on motor because of lower starting torque.

SAVINGS:

Based on cost of electricity of $0.015 per kw-hr and operating time of 3000 hr per year, power savings cost is $270 yearly. Lubrication costs reduced from $18.75 per year to $0.56 for lubricant plus $18.11 labor saving per year for lubrication.

Data courtesy the Fafnir Bearing Co., New Britain, Conn.

SUBJECT:

Painting household electrical appliances, such as circulating fans, hair dryers, table stoves, circulating heaters, etc.

PROBLEM:

To reduce operating cost, increase production rate and improve quality of product. Present hand spray method is slow, considerable handling required and paint rejects up to 10 pct are encountered.

RECOMMENDATIONS:

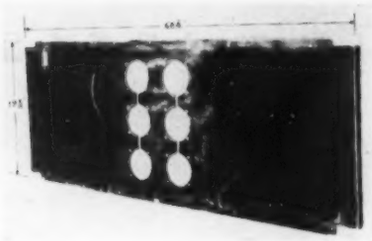
Use electro-spray unit. Multiple loading feature decreases handling requirements and together, with straight-line, continuous operation provides a 50 pct increase in production rates through paint department. Improved uniformity of paint film reduces oven baking time.

SAVINGS:

Labor saving of 4 to 5 persons; 50 pct saving in paint due to control of overspray, uniformity of paint film and reduction in paint rejects to 2 pct.

Data courtesy Ransburg Electro-Coating Corp.

Continued



SUBJECT:

Manufacture of steel vertical pan panel for electrical switchgear equipment.

PROBLEM:

To increase production rate. Present practice of piercing 68 holes of various sizes in ⅛ in. sheet steel, using a press brake and punch press, requires 47½ hr total working time, including setup.

RECOMMENDATIONS:

Suggest use of turret punch press, because panels can be produced in one handling operation by only one man and considerable saving in working time is obtained.

SAVINGS:

Total working time, including setup, is 23 hr, indicating a 51 pct saving in time. Labor saving obvious.

Data courtesy Wiedemann Machine Co., Philadelphia

SUBJECT:

Inspection of steel billets, bars, rods, rails, tubes and small slabs.

PROBLEM:

Inspection on floor is dangerous, difficult and expensive. When inspected on machine before chipping slows down machine, increases labor requirements.

RECOMMENDATIONS:

Suggest use of hydraulic inspection table because: (1) Flaws more accurately marked because inspector is closer to work; (2) increased production because inspection is faster and one inspection table can keep a battery of chipping machines operating; (3) instead of six inspectors to work simultaneously with six chipping machine operators, only one inspector required to keep all machines at capacity.

SAVINGS:

Production increased up to 15 pct; 60 pct of material passing through chipping machines instead of 90 pct; reduced inspection personnel requirements estimated at $15,000 (at $3000 annual wage).

Data courtesy The Bonnet Co., Canton, Ohio

SUBJECT:

Extending service life of trolley shoes.

PROBLEM:

To overcome necessity for replacing worn trolley shoes, since units cost $2.04.

RECOMMENDATIONS:

"Cobble" the shoes by brazing a short piece of nickel-silver welding rod to each side of the worn shoe. The nickel-silver work hardens to 200 Bhn, which is the desired hardness for the wear to which the shoe is exposed. Service life and performance exceed that of original shoes.

SAVINGS:

Shoes repaired in above manner cost $0.49, which is a 76 pct saving.

Data courtesy All-State Welding Alloys Co., Inc., White Plains, N. Y.

SUBJECT:

Drying high bake zinc chromatic primer on some 8000 motor coach fabricated parts and assemblies.

PROBLEM:

To reduce baking time and oven floor space requirements. Conventional systems require 300 ft of oven and take 20 min to accomplish baking operation.

RECOMMENDATIONS:

Use infra-red, ceiling suspended baking oven. Double unit, as shown in accompanying photograph, can be operated from 440-v, three-phase current, effecting considerable economy in power loading and wire and control costs. Baking time is reduced, floor space requirements are eliminated and quality control is improved.

SAVINGS:

Baking accomplished in 5 min.

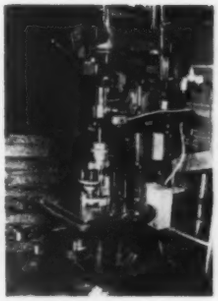
Data courtesy the Fostoria Pressed Steel Corp., Fostoria, Ohio

SUBJECT:

Drilling six No. 70 holes in head of aluminum brake piston for master cylinder in hydraulic brake system.

PROBLEM:

To reduce cost of drilling operation. Present method, using a manually operated drill press with single workholding fixture, costs $0.205 per 100 pieces.



RECOMMENDATIONS:

Use a drill press equipped with a multiple spindle drill head and a special indexing fixture. In operation, one station is loaded on index fixture and piece is rotated to position under spindle. After drilling, piece is automatically unloaded. Advantages are: reduction in operating cost and reduction in worker fatigue.

SAVINGS:

Cost per 100 pieces reduced to $0.1104, a saving of 46 pct, plus substantial drill saving.

Data courtesy the Bellows Co., Akron, Ohio

SUBJECT:

Use of AISI steel retaining rings as artificial shoulders in lieu of machining shoulders on shafts.

PROBLEM:

To reduce cost of present method, whereby extensive machining of shoulders on shafts wastes bar stock raw material and entails machine labor and overhead costs.

RECOMMENDATIONS:

Use retaining rings to form artificial shoulder by turning groove in shaft or bore and applying retaining ring.

SAVINGS:

Savings in raw material costs, machine labor and overhead resulting from elimination of relatively extensive machining operation, are readily apparent.

Data courtesy the National Lock Washer Co., Newark, N. J.

SUBJECT:

Production finishing of home appliance equipment.

PROBLEM:

To reduce production costs. Present finishing process requires ten steps, involving considerable handling, and is therefore somewhat costly and inefficient.

RECOMMENDATIONS:

Revise layout of finishing department to incorporate complete conveyerizing of the finishing line, automatic spraying and modernized baking equipment. Revision makes possible elimination of four of the ten steps and results in significant cost savings.

SAVINGS:

Reduction of 75 pct in manhours required to finish a single unit; time required to finish a single unit decreased by 60 pct; and 40 pct drop in finishing material requirements.

Data courtesy the Glidden Co., Cleveland

SUBJECT:

Handling steel wire coils.

PROBLEM:

Reduce handling costs of semifinished wire raw material. Incoming material, arriving in boxcars and highway trucks, requires four men from 4 to 5 hr, with hand trucks, to unload and store coils. Also, wire drawing machine cannot operate at full capacity due to slowness of delivering semifinished wire to machines.

RECOMMENDATIONS:

Suggest use of fork truck because: (1) coils of wire can be handled six at a time, reducing considerably handling time, and increasing production finished wire; (2) truck can stack coils two and three high, increasing existing storage facilities.

SAVINGS:

Cost of unloading a boxcar reduced from $17 to $1.40; production output doubled; existing storage capacity increased 40 to 50 pct.

Data courtesy Baker Industrial Truck Div., Baker-Raulang Co., Cleveland

Continued

SUBJECT:

Production of bearing housings for two railroads.

PROBLEM:

To reduce cost and increase quality of product. Present cast housings have high initial cost, high scrap loss, considerable variation in dimensions, relatively low machinability, are heavy, and about 80 pct of housings produced must be salvaged by welding to eliminate leakage.

RECOMMENDATIONS:

Manufacture housings by forging two separate halves from 1035 steel and then weld together by submerged arc process. Advantages arise from (1) lower initial cost, (2) low scrap loss, (3) greater dimensional uniformity, (4) less weight for equal or greater strength, (5) increased machinability, and (6) little or no salvage necessary.

Data courtesy the Steel Improvement & Forge Co., Cleveland

SUBJECT:

Electrolytic pickling stainless steel strip.

PROBLEM:

To obtain dependable anode contact to be applied to moving steel strip to remove oxidation and brighten strip. Bronze wool and rollers permit occasional sparking which causes pitting in the steel; also contact sometimes fails.

RECOMMENDATIONS:

Suggest use of anode contact made from a metal-back brush strip, filled with 0.014 in. crimped copper wire, for improved performance, without spark-pitted scrap.

SAVINGS:

Operating time is increased approximately 2.5 pct resulting in an increase in production of $1000 to $3000 per month.

Data courtesy Fuller Brush Co., Hartford, Conn.

SUBJECT:

Annealing and scale reduction prior to machining of forged AB620 gears and pinions for automotive and truck rear axle assemblies.

PROBLEM:

To reduce cost of operation and handling, since present method involves two separate operations; scale removal by tumbling or sand blast, and annealing in controlled atmosphere furnace.

RECOMMENDATIONS:

Use an atmosphere cycle annealing furnace with variable control over critical cooling rate. Forging scale is reduced to machinable limits with resultant savings in cost of forgings, in plant storage and handling labor. Variable control over cooling cycle makes furnace adaptable to other types of steel.

SAVINGS:

Combined annealing and cleaning costs reduced to about $5 per ton, depending on plant location, labor, price of fuel, etc.

Data courtesy George J. Hagan Co., Pittsburgh

SUBJECT:

Drilling holes in 5/16 in. steel sheet in fabrication of side sheets for 70-ton railroad hopper cars.

PROBLEM:

To reduce cost and time of making 198 holes per side sheet. Present method calls for stacking and clamping together 10 sheets at a time, then punching the outside sheets and burning the inside sheets. Operation requires three mechanics and three helpers, for a total of 80 to 90 man-hr.

RECOMMENDATIONS:

Use a portable drill press of the type shown in the accompanying photograph. By stacking and clamping together 10 sheets at a time, two men can complete the operation in less than 8 hr.

SAVINGS:

Approximately 60 to 70 man-hr for each 10 sheets.

Data courtesy Guibert Steel Co., Pittsburgh

Research and Quality In the Steel Industry

SUMMARY: Considerable effort has been, and is being, expended by the steel industry, in an effort to supply the steel consumer with a product higher in quality, but low in cost. Various phases of steelmaking are explored, in this article, from the standpoint of existing problems and research measures that have been taken to overcome the difficulties. Instrumentation and mechanization developments are also considered.

By CHARLES M. PARKER

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American Iron and Steel Institute,
New York

A SUBSTANTIAL amount of the $2 billion which steel companies have spent since World War II in expanding and improving their facilities will effect economies in production. Few of the savings which have been made can be reflected in the price of steel products because for several years the industry has been operating under restrictions imposed by the declining quality of raw materials. Economies in operation have frequently meant stop-loss rather than profit.

Although the steel industry sells a tangible product, which has a high weight:bulk ratio, it is really a service industry. It produces its salable products to specifications which are largely set by consumers of steel. Consumers are, of course, obliged to order the tonnages and kinds of steel which will best serve their needs.

As scientific and engineering knowledge advances, consumers of steel devise new products and improve old ones, conditions which pose new problems to the steel industry. It is paradoxical that in the days when high quality raw materials were abundant, the demands of steel consumers were easy to meet, and that now with declining qualities of raw materials, consumer demands are becoming increasingly difficult to meet.

The industry's difficulties start at the blast furnace. Sulfur contents of coking coal, ore and limestone are rising in the face of a tendency on

the part of consumers to require even lower sulfur contents in their steel. That desire is dictated in most instances by the end use to which the steel is to be put or the method of fabrication employed.

Quality of coking coal has declined substantially in the past 10 years. Reserves of high grade coal have been depleted and mechanized mining methods have decreased the selectivity of mining as well as increasing the quantity of slate and other debris brought to the surface. Sulfur content has risen three-fold and ash content has doubled. Such conditions make necessary the use of increased quantities of limestone to flux off the impurities, which make necessary higher coke consumption and decreased air volume.

In order to counter those conditions, the industry is washing and cleaning coal to rid it of debris and decrease sulfur. Washing (see fig. 1) removes about two-thirds of the inorganic sulfur present but removes none of the chemically combined organic sulfur. Blending is also practiced to secure greater uniformity and to permit the use of strip coal and anthracite fines.

The amount of iron ore necessary to produce a ton of pig iron has also risen in the past 10 years. Enormous tonnages of the top quality grades have been mined out and the remaining lower grades contain less iron and more silica. Substantial tonnages of ore must be washed, screened and sized before shipment, and blending is a universal practice.

FIG. 1—Resembling a giant cake mixer, this coal thickening basin at the Robena mill of H. C. Frick Coke Co., is helping to produce a highly improved grade of coking coal. The thickener, 180 ft in diam, is an important factor in the new Robena coal washing plant. This washing plant reduces ash and sulfur content in the coal.

The physical condition of much of the iron ore now being taken from pits in the Great Lakes region, and the physical condition of ores of all regions of the United States which must be beneficiated before use in blast furnaces, makes an agglomerating or sintering operation necessary. Also, flue dust is high in iron and must be utilized efficiently and economically.

There are in use at the present time many systems of sintering, and many opinions exist as to what constitutes an adequate sinter for blast furnace use. There is difference of opinion, too, as to how to measure the performance of sinter and its effect on iron production. Moreover, some operators hold that the function of sintering goes beyond the bonding together of fine particles. There is agreement, however, that present methods of sintering do not always deliver an adequate product since much degradation occurs between sintering machine and blast furnace skip.

In one method of agglomeration, see fig. 2, ore fines are placed on a train of pallets (right foreground) together with some fine "return" sinter to increase bed porosity and a suitable fuel such as fine coal, coke breeze or blast furnace flue dust. The pallet train moves about 6 fpm first under a gas fired ignition burner, where the surface of the bed is ignited, and then over a series of wind boxes where a powerful fan draws air through the bed, causing the combustion zone to travel downward. At the discharge end of the machine, this combustion zone has traveled through the bed and its heat has caused the fine particles of

Photographs with this article by courtesy of U. S. Steel Corp.—Ed.

ore to stick together forming a sinter cake. The sinter cake breaks into suitable size for blast furnace use when it strikes the discharge chute, and the fine material that is also produced here is returned to the machine. The sinter is cooled by water sprays to prevent damage to the railroad cars into which it is discharged. In the extreme left foreground of the figure can be seen one of the pallets which make up the conveyer system onto which the material to be sintered is charged.

Under a research program to be conducted by American Iron and Steel Institute at Mellon Institute, a comprehensive study of present sintering practices and blast furnace requirements will be made.

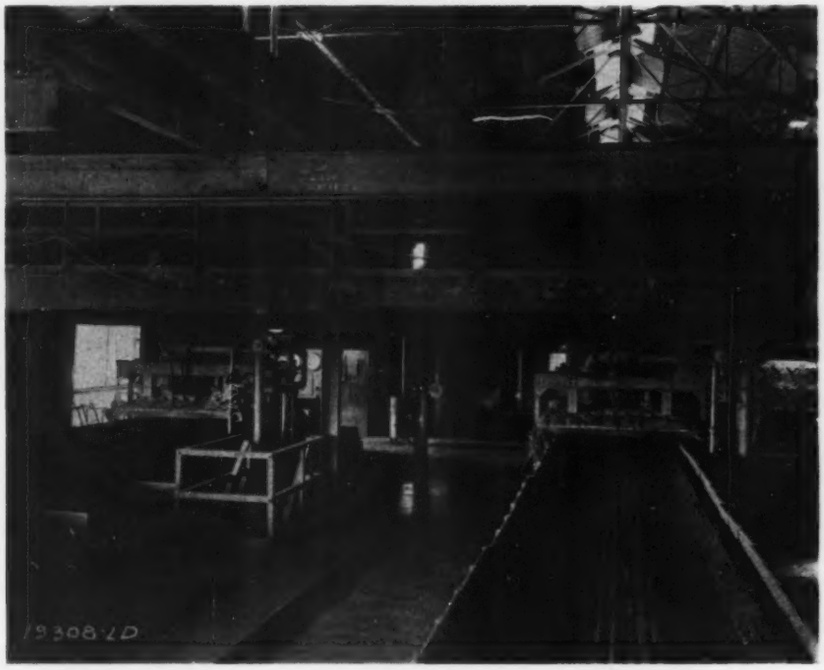


FIG. 2—Small particles of iron ore must be agglomerated into larger pieces in order to make them physically suitable for charging into the blast furnace. One method of agglomeration is accomplished on sintering machines, such as the one illustrated.

Incidentally, ore of proper quality to use in openhearth furnaces as a chemical agent has become so scarce that large tonnages are imported from Europe and South America.

In spite of efforts expended on coal and ore, the sulfur content of much hot metal is too high for economic steelmaking. In the steelmaking process the most logical point at which to reduce sulfur content of the metal is at the blast furnace stage, because most of the sulfur enters the steelmaking cycle in coke and ore. Scrap, having been at least once refined, is a low sulfur raw material when properly sorted and graded.

At the blast furnace the steelmaker has the choice of attempting to remove sulfur from the hot metal as it leaves the blast furnace or attempting to remove increased quantities of sulfur in the blast furnace process by increasing the sulfur-carrying capacity of slag.

Methods have been devised to reduce the sulfur content of hot metal as it leaves the blast furnace, but such methods leave something to be desired, inasmuch as they cause objectionable fumes and require additional facilities and materials. Reduction of sulfur in the blast furnace would seem to be more desirable from both a metallurgical and operating point of view.

Next to the raw materials from which steel is made, refractories are the most important materials of manufacture, because without them the molten metal could not be confined and handled economically and safely. The development of new processes of manufacture and the high promise of even more efficient methods, as well as the demand for superduty refractory materials in melting high alloy high strength metals for use at elevated temperatures, focuses attention on some pertinent problems of industry-wide occurrence and interest.

There are numerous oxide systems or portions of systems of interest to the refractory technologists of the steel industry which have not been studied. In order to make significant future advances in the field of refractories for steel plants, the nature of chemical reactions involved must be understood. The development of superior silica bricks of forsterite refractories and of mullite refractories, to give only three examples, was possible because phase equilibrium studies of silicate systems had been made.

Use of carbon as a refractory material for blast furnace hearths has posed problems which were not anticipated when the installations were made. It was hoped that carbon refractories would reduce blast furnace downtime by reason of their superior load-carrying capacity at elevated temperatures and their relative immunity to chemical attack by slag and gases under reduc-

ing conditions. Carbon refractories have exhibited many virtues but at the same time they have also exhibited weaknesses which prevent their more extensive utlization, at least until more knowledge relative to their characteristics and performance is available.

Because their potential value is so high, a comprehensive research program has been planned at Mellon Institute which will comprise an investigation of commercial grades of carbon, suitable for blast furnace linings. The investigation will include chemical composition, physical properties such as porosity, actual and apparent specific gravity, bulk density, expansion characteristics at service temperatures, volume stability, thermal conductivity, gas permeability, modulus of elasticity at 2500°F, mechanical strength at normal and elevated temperatures, reaction with gases and the action of titania on carbon.

In the mills much work has been done toward the improvement of ladle refractories, particularly nozzles, in an endeavor to improve pouring practices and thus reduce surface defects which might be caused by splashing. Studies are being continually pursued to reduce the quantity of nonmetallic inclusions which are attributable to the entry of refractory materials into steel by abrasion and erosion.

Ingot mold design is being studied carefully both to improve quality of final product and to increase yield. The ratio of height to cross-section is being examined in an effort to minimize piping and the bottom contour of hot top ingots is being studied as to its effect on quality. A new hot top is in use which employs an electric arc to keep the sinkhead liquid.

Metallurgy has sometimes been defined as chemistry at high temperatures. The chemistry involved concerns not only the metal itself but the materials by which the metal is brought to desired chemical composition and physical condition. The complementary materials form slag, the chemical behavior of which is of major interest in all phases of iron and steel manufacture. In order to improve steel quality or to develop new kinds of steel and new methods of steelmaking, a clearer and deeper understanding of slags is necessary.

The concentration of the oxide ion in slag determines its basicity but up to now no direct means is available for measuring this concentration. Other ions present in slag are positive metallic ions such as calcium and complex negative ions such as orthosilicates and metasilicates.

One of the most important reactions in steelmaking is that which takes place in molten iron between dissolved silicon and oxygen. A complete knowledge of the reaction under various conditions is necessary to the steelmaker in order to understand the molecular constitution of iron silicate slags. The distribution of oxygen between liquid iron and iron oxide is known over a range of temperatures and with the new data secured from the Institute research project at Carnegie Institute of Technology the possibility of calculating from slag composition the oxygen distribution between liquid iron and iron silicate slags is indicated. Such calculations will make possible improvements in deoxidation practices and the minimizing of retained inclusions.

The use of oxygen in steelmaking has now settled down to the point where it may be talked about as just another production tool. Nearly

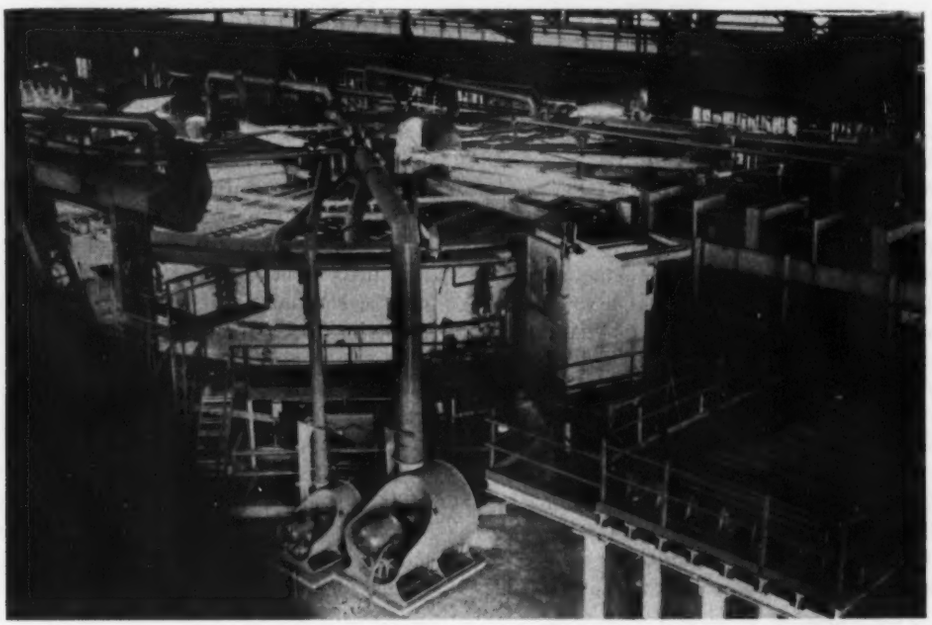


FIG. 3—Overall view of the rotary hearth billet heating furnace in the Gary plant of National Tube Co. Billets at lower right are stacked on the feed table leading to the charging machine.

all plants have experimented with oxygen in one way or another. Some operators claim considerable advantage, others state that results have been indifferent, and still others claim that no benefits have accrued from its use.

Oxygen is used in steelmaking in two entirely different ways; one use is to speed combustion of the fuel and the other is to oxidize the carbon in the bath.

Accelerated oxidation has two distinct advantages, the more rapid carbon drop saves time,

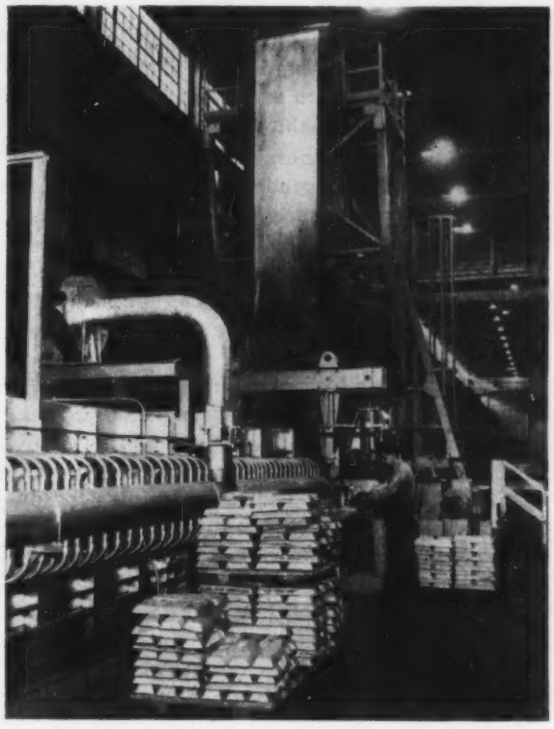


FIG. 4—Feeding 85-lb zinc pigs to the galvanizing bath on new heavy gage continuous galvanizing line at Carnegie-Illinois' Irvin Works. Emerging from the molten zinc pool, the mirror-like steel ribbon climbs roofward, up and over the cooling tower on its way to the continuous line.

the increased bath temperature increases the fluidity of the slag, undissolved lime goes into solution and fuel is saved. In fact some plants report that they must reduce the fuel rate during accelerated oxidation. Moreover, less bank erosion is experienced in the openhearth furnace, since banks are exposed to high oxide slags for a shorter time than in normal practice. The chief disadvantage of the use of oxygen in this operation is splashing of the slag which may erode the roof and front wall of the furnace.

The use of oxygen for decarburization is made use of most commonly by shops making low carbon steels. The reason for this is the normal slowing down of carbon elimination in the neighborhood of 0.12 pct C. Oxygen speeds up the drop at these low carbons and maintains or increases the bath temperature. Its use is of particular value in this connection in the manufacture of low carbon stainless steels in the electric furnace.

The advantage in using oxygen to accelerate the combustion of fuel is the decrease in heat time from charge to tap, but in order to take advantage of this rapid heat input without damage to the furnace, the charge must be able to receive it. The general practice is to use oxygen during the melt-down period or up to the addition of hot metal.

No substantial increase in the quality of steel has been observed, but oxygen has delivered up-to-standard quality in the face of inferior raw materials. It is thought by some that the use of oxygen reduces the sulfur content of steel somewhat.

The temperatures which are attained in the bath by the use of oxygen have not directly caused refractory failures but it is thought that they have some indirect effect because of splashing. The high temperatures have, however, made it more important than ever that the temperature of the steel be controlled from tap to pour, and new instruments have had to be devised to measure the temperatures with greater accuracy. Close control of tapping and pouring temperatures result in improved surface quality and improved yield, particularly in rimming steels. Because of the increasingly difficult jobs that rimming steels are called upon to do, because of their superior surface quality, this development is a most important one.

Soaking pits have been improved as a means of enhancing surface quality, and powder scarfing methods have been devised to condition the surface of oxidation-resistant steels. This type of scarfing takes much less time than grinding. Rotary hearth furnaces (fig. 3) for precise heat control have been built in an endeavor to improve the surface of seamless tubes by reducing the amount of scaling to which billets are subjected. In general, throughout the industry, furnaces have been enlarged, larger ladles and heavier cranes have been installed, openhearth furnaces have been placed under automatic control and almost completely instrumented in order to substitute science for judgment.

Experiments of great promise have been made with a side-blown bessemer converter containing a magnesite lining. It is expected that by this method a low nitrogen, low phosphorus steel, well suited for severe deep drawing operations, may be produced.

In the rolling mills so many improvements have been made that it is only possible to touch on some of the more important ones. Electrification of the industry has proceeded rapidly and the tendency in nearly all mills is to operate each unit, and sometimes the many components of a mill, by individual electric motors. In this way higher speeds and more complete controls have been achieved.

The use of electronic controls and magnetic amplifiers is quite common. There are now in operation cold mills controlled by the regulating-tensiometer, an instrument which regulates the speed of one stand of rolls with respect to the

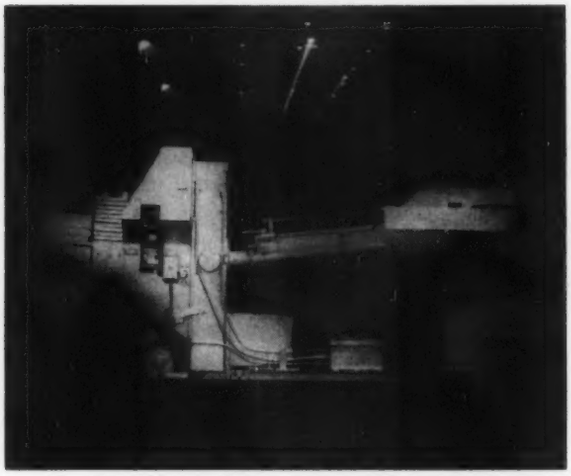


FIG. 5—An X-ray thickness gage in use in the plate and coil mill at a plant of Geneva Steel Co. The gage measures thickness of breakdowns before they enter the coiler.

next, and so makes possible better grain size control and closer tolerances. There are four-high reversing cold strip mills in which the back-up rolls are driven and the strip is rolled under high tension. These mills make possible the rolling of stainless and electric steels at approximately three times the rate of a conventional mill.

Strip steel is now being heated for rolling and annealed by induction, which results in better quality. Continuous tin coating and galvanizing lines are in operation (fig. 4) which produce a more adherent coat that will not flake or break in forming, and which is more uniform than the coating produced by conventional methods. They also make possible the production of these quality materials in heavy coils well suited for use on automatic fabricating machines.

Electric flying shears have been installed on strip mills. These shears are electronically controlled and make possible not only faster cutting but cutting to closer tolerances. Closer tolerances on thickness are also made possible by the X-ray gage (fig. 5), which permits continuous gaging of hot strip and sheets.

Some sizes of high alloy steel tubing are now being produced by extrusion methods. This process is being used for alloys which cannot be pierced by conventional seamless tube mills.

Industrial wastes are sources of economic loss, and large quantities of reaction products are wasted every year for lack of economic processes to convert the potentially valuable constituents to useful form. When the locked-up ingredient of value is derived from a material which is scarce in this country, as in the case of manganese or chromium, or when it is nonexistent, as in the case of palm oil, recovery methods or alternate materials made from domestic ingredients assume new proportions.

Approximately 7500 tons of palm oil are consumed annually in making hot dip tin plate in the United States. All this oil is now imported from North Africa and the East Indies over long shipping routes and the United States is in a strategically unfavorable position should an emergency arise which might imperil shipping lanes.

A synthetic substitute for palm oil has been developed at Armour Research Foundation in a program sponsored by American Iron and Steel Institute. The substance used is a fatty acid known as dimerized linoleic acid which is made from common vegetable oils. While hot dipped tin plate has been made successfully with the substitute material there still remains some problems to be solved in order to make it an economic substitute for palm oil.

Next to iron, manganese is the most important element found in all grades of steel. Unfortunately its nature is such that there is no important quantity returnable from scrap to assist in relieving shortages, and even the most effective conservation measures can do little to extend the life of stocks on hand because proper and adequate use is essential to maintain steel quality. The iron and steel industry uses over 90 pct of all the manganese consumed in the United States and more than 90 pct of this country's total requirements are normally imported from foreign sources. The United States is, for practical purposes, a have not nation, with regard to manganese, for while extensive deposits of manganese ore do exist in at least seventeen states, these are of such low grade as to render their use for standard ferromanganese technically unfeasible in the present state of knowledge of the beneficiation of such ores.

Most of the manganese entering the open-hearth charge is in the pig iron and when the percentage of iron exceeds 45 pct, some slag is "flushed" from the furnace early in the heat. As the percentage of molten iron increases, the amount of flush slag increases, until at about 65 pct molten iron the flush slag may nearly equal the tap slag in weight. A survey of the manganese contained in the flush and tap slag from the industry's basic openhearth furnaces has indicated that the amount of manganese in these slags is roughly equal to the manganese used by the steel industry in the form of ferroalloys.

The major technical problem in the recovery of manganese from these slags is the separation of manganese and phosphorus. Possible manganese recovery from these slags is of such interest that the institute has sponsored a project with the U. S. Bureau of Mines for that purpose.

All these facts show that much research work remains to be done. Some of it appears to be very difficult and some of the problems currently overcome may have to be reworked, but the important fact stands out that in recent years, quality of steel has been maintained and improved in spite of less desirable quality of basic raw materials received by the steel industry.

21 WAYS

TO LOWER ARCWELDING COSTS

By ROBERT WILSON
Engineer in charge of Welding Applications, Lincoln Electric Co., Cleveland

SUMMARY: Economy in production, as related to welding, lies principally in ability to reduce material consumption and/or welding time. A comprehensive appraisal of 21 specific possibilities for accomplishing such savings are outlined in this article from the standpoint of design, production and procedure considerations.

MANUFACTURING costs are created by the consumption of time and material. Welding costs are a combination of the amount of metal needed to make a welded joint and the amount of time required to use that metal. Material is both electrode metal and base metal while labor is both direct labor and indirect labor, in such elements as supervision and power.

Any discussion of how to reduce welding costs must be an investigation of ways of using less time and material to do the same or equal job of joining metals. Such an investigation must start with the beginning of the product, or its design, and carry through production methods to the welding procedures used. Each step of the investigation must be initiated with the question, "Is this step being done in the cheapest way possible consistent with the end use of the product to be made?"

The following suggestions will indicate guides to fields where further investigation will yield many production savings.

There are many ways by which the designer can contribute to lower welding costs:

Material—Material for a design should be selected as far as possible within a range of analysis which will normally not require special welding procedures. Nearly all metals are weldable but some require special procedures

for successful results. As electrode development produces new and better electrodes, fewer metals fall into this class of requiring special procedure. An example of a recent development is the low-hydrogen, lime-ferritic electrode which readily deposits dense, strong, ductile welds in high carbon and high sulfur steel normally considered to require special procedures.

Material Size and Shape—In planning an assembly, the size of plate used not only affects the amount of material directly, but also heavier plate will probably require more weld metal. Frequently designs can be changed to reduce plate size yet maintain strength requirements.

Steel mills are now supplying a variety of rolled shapes which lend themselves to making cost savings in weld designing. Beams, channels, T-sections and other shapes are rolled with rounded corners. In some cases it may be economical to make special shapes out of standard shapes by welding them to fit the design. This is fairly common practice in both structural work and machine design (fig. 1).

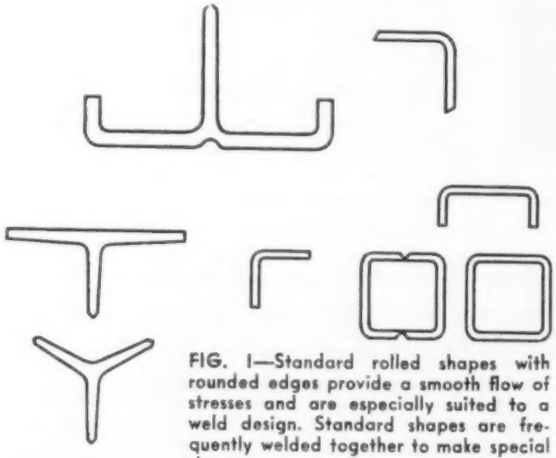


FIG. 1—Standard rolled shapes with rounded edges provide a smooth flow of stresses and are especially suited to a weld design. Standard shapes are frequently welded together to make special shapes.

Joint Design—It is not difficult for a designer to determine the required strength at a given joint. Once this is determined, however, it becomes a matter of importance to fabricating costs what type of welded joint the designer specifies to achieve desired strength. There is considerable choice as to joint type and the designer must select this with one question in mind. What is the cheapest joint that will meet strength and appearance requirements of the job?

Welded joints are made in two ways; either by making a joint that consists largely of fused base metal or by making a joint consisting largely of deposited filler metal. The most economical weld will be that which requires the least edge preparation, the minimum amount of deposited weld metal and which can be made at maximum deposition rates.

Designers should be familiar with types of joints and their load characteristics so that selection can be made depending on load conditions. Depending upon load conditions, the designer can select the joint that will result in minimum deposited weld metal and minimum edge preparation.

For example, if a buttweld with 100 pct penetration is desired, several possibilities are available. The square butt joint (fig. 2) involves no edge preparation but it may have to

FIG. 2—Square edge, single V and double V buttweld illustrate different ways of welding butt joints.

be welded from both sides. This joint requires the least amount of deposited metal. The single V-joint requires more preparation and more electrode than the square butt joint. With the double V-joint, cost of machining is higher than the single V; however, it requires only half the amount of electrode for the same plate thickness.

In selecting the cheapest joint, therefore, both cost of welding and cost of machining in a given plant must be determined and the selection made for various types of joints and for various thicknesses of plate according to these basic cost figures.

Important also in specifying the cheapest joint is the location of the joint. Designers must avoid calling for welds in inaccessible locations. Familiarity with the welding process to the point of actually doing some welding will help the designer avoid putting welds in spots which cannot be reached with an electrode (fig. 3).

Overwelding—Any amount of weld metal in addition to that needed for specified strength is useless and costly. A slight amount of buildup cannot be avoided in some cases, such as a square edge butt joint. Where it cannot be avoided, buildup should be kept at a minimum.

Intermittent Welds—Frequently, design conditions permit the use of short intermittent welds. A series of short welds will be cheaper to make than one long continuous weld.

Continuous Small Welds—Sometimes overlooked by designers is the fact that a small continuous weld can produce strength equal to that of large intermittent welds. A 6-in., ¼-in. fillet weld is equivalent in strength to a 3-in., ½-in. fillet weld. The ¼-in. weld will require only half as much deposited weld metal as the ½-in. weld and can be made at twice the speed (fig. 4).

Grinding and Finishing—Grinding is frequently an expensive operation and the designer

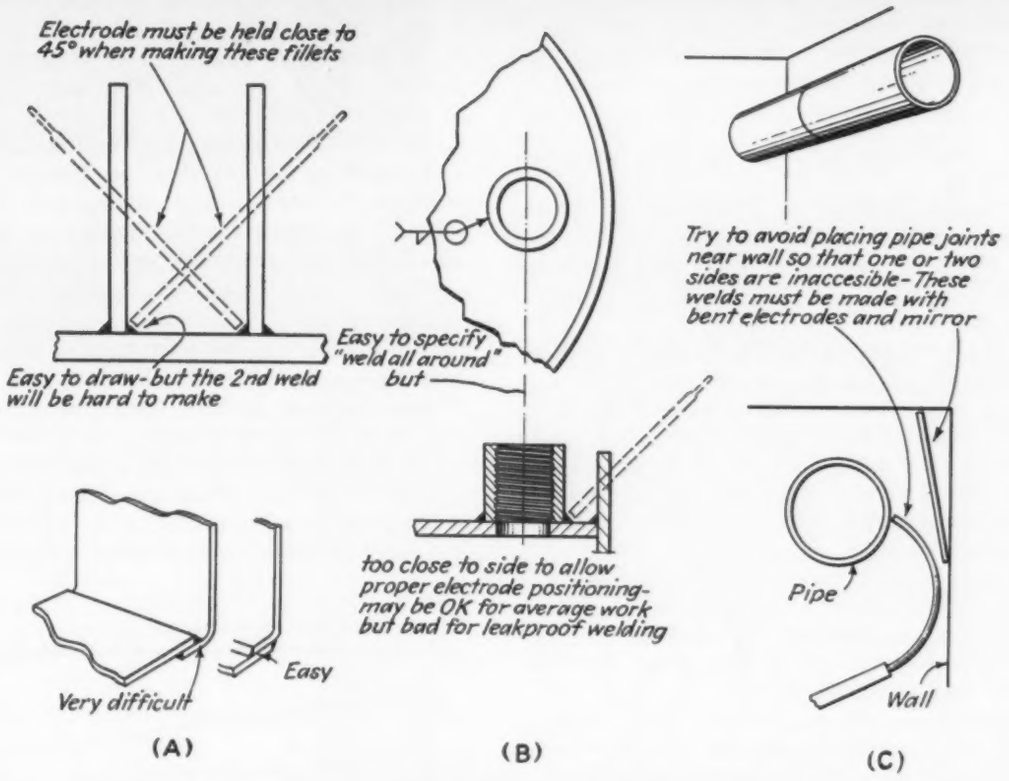

Electrode must be held close to 45° when making these fillets
Easy to draw- but the 2nd weld will be hard to make
Easy to specify "weld all around" but
too close to side to allow proper electrode positioning- may be OK for average work but bad for leakproof welding
Try to avoid placing pipe joints near wall so that one or two sides are inaccesible- These welds must be made with bent electrodes and mirror
Pipe
Wall
Very difficult
Easy
(A)
(B)
(C)

FIG. 3—Cost of welding is increased when welds are specified in locations where they will be difficult to make. Allowance must be made for room in which to manipulate electrode at the proper angle.

should attempt to avoid it as much as possible. Welds can sometimes be placed on the inside of structures where they do not show, thus eliminating grinding (fig. 5). Grinding is also minimized by avoiding overwelding while welds deposited with the "hidden arc" process frequently are smooth enough as deposited.

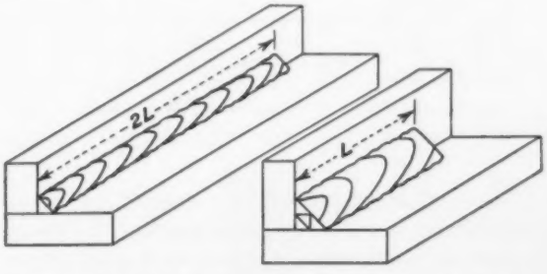


FIG. 4—Small continuous welds can produce strength of large intermittent welds at much less cost. Both welds shown here have the same strength, yet weld on left requires ½ of the weld metal, hence twice the speed. Weld at right has 4 times the cross-sectional area as small weld on left.

Weldments should also be designed so that parts requiring sandblasting and painting are accessible.

Minimize Welding—It is cheaper to form than it is to weld, and wherever possible, corners should be formed rather than welded. Various combinations of parts are possible and the availability of cutting and forming equipment and the cost of its operation will influence the choice of the most economical design.

Formed heads are now manufactured in a variety of sizes and shapes. The use of such heads in place of fabricating will materially reduce the cost of making containers.

Steel castings and forgings can also be used toward making cost savings in the design of a weldment. Factors such as the number of weldments to be made, limitations on fillet welds, inaccessibility and change in section will influence the decision on the use of castings or forgings. Bearing housings present an example

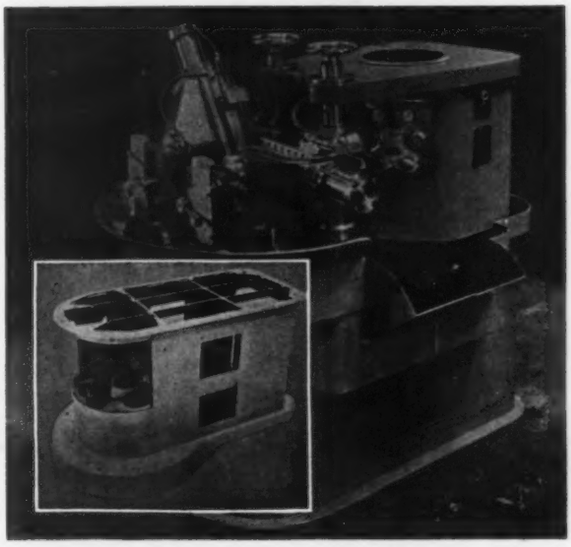


FIG. 5—This vertical lathe was designed to keep visible welds at a minimum, thus eliminating grinding operations. Welds were also carefully placed to avoid distortion.

where sometimes forgings can be used to advantage.

Distortion—Control of distortion in weldments produces many manufacturing economies, such as savings in machining through precision welding and elimination of straightening operations.

The first consideration is to design to reduce the effective shrinkage forces created by the welding. This means using smaller welds and avoiding overwelding. Intermittent welds and minimum weld metal should be used. Welds should also be placed near the neutral axis of any structure so that the leverage of the shrinkage force is reduced.

Another design consideration to control distortion is that of balancing one shrinkage force against another. This may be done by placing welds on the structure so that as one section of weld metal shrinks it will counteract the shrinkage force of previously made welds. Placing welds intermittently on opposite sides of the neutral axis of a buttweld is example of this technique. Fillet welds can be made by staggering intermittent welds.

Design and Production

Design and production must work closely together so that a design is created which can economically be manufactured with equipment available in a given plant. Designers may find existing production methods restricting, but acceptance of the restrictions usually result in the most economical design.

Choice of Process—There are other methods of welding than arc welding, and it is possible that some other method of welding may be the most economical.

Both ac and dc welding currents have their particular advantages. In general, ac welding will produce economies when welding in heavy plate on structures where arc blow is a deterrent to high welding speeds. Direct current has a decided advantage in its versatility and in welding sheet metal.

Where quantity of production and uniformity of the shape of weldments permits, automatic hidden arc welding will usually produce savings of a nature that warrant an outlay for equipment and fixtures. In some cases, automatic welding is more than three times as fast as hand welding. In addition, further savings will result from the automatic nature of the operation. Greater penetration, resulting in less weld metal needed, and faster deposit rates are both obtained because of the higher current densities employed by the process. Less distortion is encountered. There is little or no cleaning and finishing operations are easier.

Edge Preparation—Several choices are open in deciding upon how to prepare material for welding. Here, as with joint selection, the method used must be a balance between the basic costs of preparing and welding. Shearing and blanking are the most economical where they can be used. Flame cutting can be done to close tolerances with modern equipment. Machining is necessary for precision work.

Fit-up—Type of edge preparation used must be selected with the importance of good fit-up in mind. Many of the economies of automatic welding are made possible because it is necessary to have a precise fit-up for automatic operation. The machine makes no allowance for variance in fit-up as does the hand operator.

If the same care is used in fitting for hand welding as is used in fitting for automatic welding, considerable cost reductions can be made.

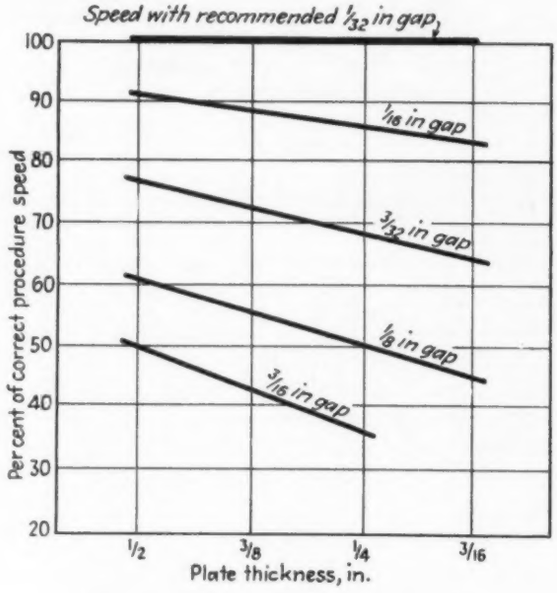


FIG. 6—Effect of fit-up on welding speed.

The importance of fit-up cannot be overemphasized, since the person making the fit-up is just as responsible for low cost production as is the welder. Fit-up not only affects cost of welding but also influences performance of the product. Figs. 6, 7 and 8 illustrate the cost-increasing effect of poor fit-up, which increases the amount of metal required and increases the amount of time through decreased welding speeds. A square edge buttweld on ½-in. plate when welded with a 1/32-in. gap can be made more than twice as fast as the same weld with a 3/16-in. gap.

Subassemblies—In planning the flow of production, time will generally be saved by using subassemblies wherever possible. This will permit easier access to many joints that have to be welded. It will facilitate inspection and, in

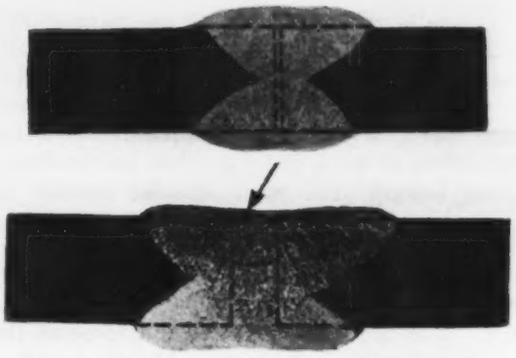


FIG. 7—Buttwelds in ⅜ in. plate, showing effect of gap on welding speed. Wider gap (B) requires sealing bead (note arrow) and more electrode metal. (A) is square edge butt with 1/32 in. gap and welding speed is 9 ipm; (B) is square edge butt with 3/16 in. gap and welding speed is 2.5 ipm.

some cases, painting and stress relieving where this is necessary.

Subassemblies will also increase the operating factor by allowing greater use of helpers to set up jobs for welders. A helper to set up a job in a jig, while the welder is welding in another, can double the output of the welder.

Positioning—Position of the joint to be welded has considerable effect on the speed and ease of welding. With the exception of sheet metal welding, welds should be made in the downhand position with the joint level wherever practical. The change from vertical to downhand can increase speed by as much as 400 pct. It also simplifies welding since the electrode coating can be dragged along the base metal. Use of jigs and fixtures will accomplish much in positioning work for fastest welding.

Inspection—Inspection can be a valuable aid in reducing costs. To get the best results, a weld should be inspected while it is being made. An inspector, by checking on type and size of electrode being used and current used, can insure that welds of specified quality are being made at minimum cost.

A check during or before a weld is made will tell an inspector more about the strength of a weld than will measuring the weld with a gage. Strength requirements will be met if correct procedure specifications are followed concerning plate preparation, electrode size and type, current and surface appearance.

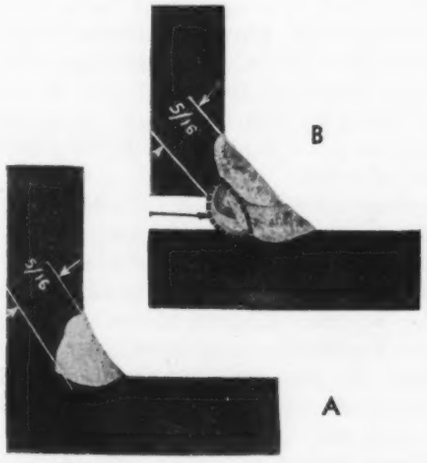


FIG. 8—Fillet welds in ½-in. plate showing effect of gap on welding speed. Welding speed of (A) is 12 ipm; (B) is 3 ipm. Sealing head (3/16 in. gap) identified by arrow.

The foregoing six suggestions are directed largely toward maintaining maximum operating factor to reduce time consumed. There are many variables that affect the operating factor, and control of these variables will depend largely on the nature of a plant's operations.

Cleaning of work to be welded to eliminate foreign matter and cleaning of finished welds are other important variables which must be controlled. Clean joints, especially for automatic welding, will avoid holes in welds. A little edge preparation, removing grease, rust and scale may mean the saving of time to make repairs to rejected welds.

Supply of electrodes, electrode changing, flow of material are other problems of production which offer the opportunity to reduce time.

TABLE I

Relationship Between Cost of Weld and Operating Factors

Operating Factor, Pct	Production, ft per hr	Cost per ft, $
20	10	0.10
40	20	0.05
60	30	0.0333
80	40	0.025
100	50	0.02

Table I shows the relationship between the cost per foot of weld to the relative percent operating factor.

Saving Time and Material

The design considerations discussed have largely been concerned with saving material, while the production considerations have been concerned with saving time. **Procedure** is the concern of both designer and welding engineer and involves saving both time and material.

Electrode Size—The selection of size of electrode is important both to reducing the amount of deposited metal in the joint and to increasing the rate of depositing the metal needed. These desirable objectives are accomplished by increasing penetration and decreasing arc time.

Fortunately, both of these can be done at the same time by taking full advantage of the natural force of the welding arc. The effectiveness of the arc force is a product of the amount of welding current and the travel speed of the arc. An increase in current increases the arc force and penetration just as an increase in the volume of water through the same size nozzle increases the digging power of a stream of water. The increased arc force will be most

effective if the arc speed is fast enough to prevent a molten pool of metal from getting under the arc and absorbing the force of the arc. The arc must be directed against the base metal and this is done by keeping the tip of the electrode ahead of the molten pool at all times, giving the arc force full opportunity to dig deep into the root of the joint.

In general, the larger the electrode it is possible to use, the lower the cost of the joint. Increasing the size of electrode will decrease arc time and increase penetration. The rate of depositing metal is proportional to the current used. Metal cannot be deposited any faster than it can be melted off the end of the electrode. Increasing the current will increase the melt-off rate and permit faster welding speeds. The increased current and the increased speed also produce greater penetration, which makes a joint consisting of more fused plate metal and less deposited metal.

For example, with larger electrodes and penetrating deeper into the corner of a fillet weld, the arc force technique of welding reduces the cross-sectional area of the deposited metal by 50 pct, requiring 59 pct less man-hr to make the weld.

In a buttweld the arc force technique allows changing from a V-butt joint in ⅜-in. plate to a plain square edge joint and cutting the amount of electrode metal deposited by 50 pct. This in turn reduces the man-hours by 78 pct.

Table II shows the relative cost of depositing 1 lb of electrode metal with different size electrodes.

The analysis of the plate, the surface appearance requirements of the job (plus the skill of the operator) will, in general, limit the amount of current that can be used on a given plate thickness with a given electrode.

Electrode Type—Certain variations in operating characteristics of different makes of electrodes will make a difference in the effectiveness of the arc force technique in securing greater penetration and greater speeds. Two ¼-in. electrodes of similar design but different makes can be tested under similar conditions and produce varying results.

The cost of operating the electrode may be influenced by slag-covering characteristics which may slow welding speeds. Slag loss, slag removal, spatter loss, deposition efficiency and melting rate will also be important.

The type and make of electrode should be selected on its ability to make the most weld of a given strength in a given time.

Polarity—Better operating conditions may be obtained with one polarity over another. With electrode negative polarity, more heat is concentrated at the tip of the electrode and more electrode is usually melted off per minute than with electrode positive polarity. There is usually less tendency for burn-through and better fill-in on poor fitup when electrode negative is used. With electrode positive and work negative, the base metal or work is hotter than the electrode.

Arc Length—For most efficient position in welding, the shortest possible arc should be used. Wherever possible, the tip of the electrode coating should be kept in contact lightly with the plate, dragging the electrode along the joint. This prevents the heat and force of the arc from being dissipated into the surrounding air and increases the effectiveness of the arc force.

A short arc also reduces the arc voltage, and hence increases the welding amperage. Higher amperage can be secured without changing the setting of the machine simply by shortening the arc.

Stub End Length—Control of the length of the stub-end of electrode which is not used is an effective means of cost reduction. Labor cost per pound of deposited metal increases with increased stub-end losses due to greater number of interruptions and lower operating factor. Material costs or pounds of electrode per pound of deposited metal increases due to stub-end waste. On the average, labor costs increase 3 pct for each 2 in. above the standard 2-in. stub-end loss. For a 14-in. electrode with a 2-in. stub loss, 1.6 lb are required to deposit a pound of metal. With an 8-in. stub loss the average requirement is 3.2 lb of electrode for a deposited pound of metal.

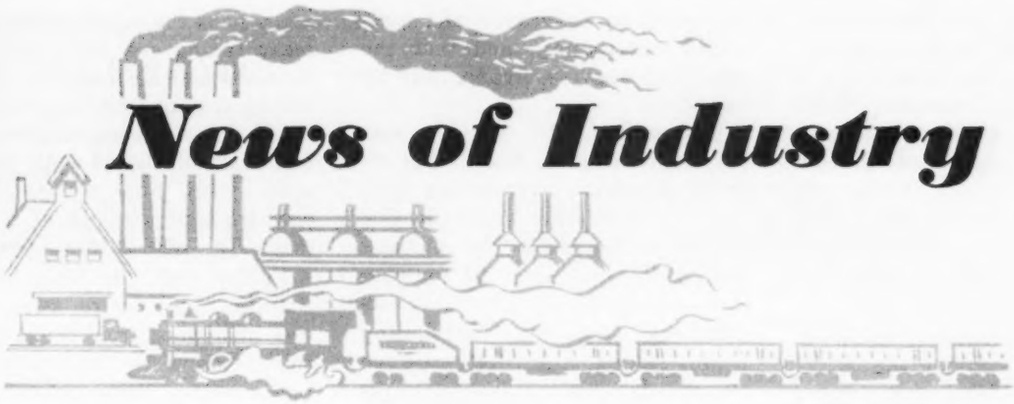
TABLE II

Relative Cost of Depositing 1 lb of Electrode with Different Size Electrodes

Size, in.	Size, in.					Automatic Hidden Arcwelding
	½	5/32	3/16	¼	5/16	
Amperes	110	130	180	250	350	800
Cost per lb, deposited metal, $	4.50	3.60	3.00	1.80	1.20	0.50
Cost per 50 lb box deposited, $	150	120	100	55	40	Less than $25

Table figured on basis of 30 pct loss through spatter stub end and coating loss; 200 pct overhead; 2¢ per kw-hr; $1.25 per hr labor; 50 pct operating factor.

Machine Efficiency—A welding machine should be used which operates at maximum efficiency under the conditions existing with the majority of welding jobs to be done. Trying to use the more efficient higher currents with too small a welder may offset cost reductions realized in the welding through inefficient welder operation. If the proper size machine is used, this will not be true as higher currents result in higher generator efficiencies. Also, some machines, both ac and dc, have special features to permit more precise control of the welding arc to produce desired characteristics.



News of Industry

Behind the Scenes

Pittsburgh—After U. S. Steel Corp.-United Steelworkers negotiators left the conference room during their daily negotiations last week, newsmen would hurry into the room to see whether some evidence had been inadvertently left behind that would disclose what had gone on.

They discovered that some of these top union and company officials were just as inclined to doodle on the tablecloth during dull moments as anybody else might be.

About mid-week the reporters' hopes for a peaceful settlement slumped sharply when it was discovered that one of the negotiators had doodled the name, "Digger O'Dell." If you are a radio fan, the name should have a familiar — and foreboding — sound. For "Digger O'Dell" is the undertaker with the sepulchral voice, in the program, "Life of Riley."

Link-Belt Opens New Plant

Houston—Link-Belt Co. opened their new manufacturing plant here on Sept. 27. The new plant has approximately 45,000 sq ft of floor space and consists of a modern machine shop, structural steel shop and warehousing facilities.

The plant is built on a 10 acre plot of ground and will serve the expanding industries of the Southwest. Mr. Allan Craig, formerly located at the Link-Belt plant in Atlanta, is general manager of the Southwestern division.

Steel Strike Centered About A Principle

Union demand that the steel producers pay all costs was not met by most concerns . . . Some mills continue to operate . . . 500,000 workers out —*By JOHN DELANEY*

Pittsburgh — What couldn't be settled across the bargaining table is being fought out on the picket lines in the steel centers of the nation this week.

And the pressure was on management, labor and the White House to get the striking workers back on the job, regardless of whose face is red, before the walkout, coming as it does on top of a widespread coal work stoppage, knocks the props from under the national economy.

But indications were that the die was cast for a long, bitter struggle. Neither side has shown any inclination to retreat from its position. Whether President Truman has any more aces up his sleeve remains to be seen.

The strike, which began at 12.01 A.M. Oct. 1, was perhaps unique in steel labor history. Unlike the great organizational strikes of the late 1930's and early 1940's and walkouts over wage demands in the immediate postwar period, this work stoppage centered about a "principle"— whether pension and social insurance recommendations of a Presidential fact-finding board will be paid for entirely by the companies or whether the workers will share in the cost.

With some exceptions, steel producers have clung doggedly to their stand that the worker should ante up something, while the CIO United Steelworkers of America has been just as firm in demanding that the companies pay all.

Over this issue, some 500,000 steel union members in basic steel

Still Going

Pittsburgh—Here are some of the basic steel producers that will continue to operate during the strike, and their rated annual ingot capacity in net tons:

Weirton Steel	1,950,000
Armco (Middletown and Butler)	1,400,000
Wisconsin Steel	900,000
Allegheny Ludlum (until Oct. 15)	900,000
Kaiser Co.	870,000
Portsmouth Steel	720,000
Alan Wood Steel Co.	555,000
Central Iron & Steel Co.	330,000
John A. Roebling's Sons Co.	253,000
Standard Steel Works	150,000
Harrisburg Steel Co.	100,750
Wickwire Bros., Inc.	38,000
Firth Sterling	20,000

walked off their jobs and the fires died down in the mills of the nation at a time when business was well on its way to a comeback after a spring collapse. The only mills that continued to operate were those whose contracts had not yet expired or who had agreed to the union's non-contributory demand, and those producers not organized by the USW.

Here is a chronological summary of developments in the key U. S. Steel Corp. — USW negotiations here after the producers and the union accepted President Truman's request of Sept. 21 for a 10-day delay of the strike—the third truce agreed upon since the contracts of all but a few companies expired July 16:

Negotiation Developments

Friday, Sept. 23 — Negotiating committees met briefly and disposed of preliminaries.

Monday, Sept. 26—Serious discussions got underway in room 735 of the William Penn Hotel. Neither side would discuss what went on in the conference room.

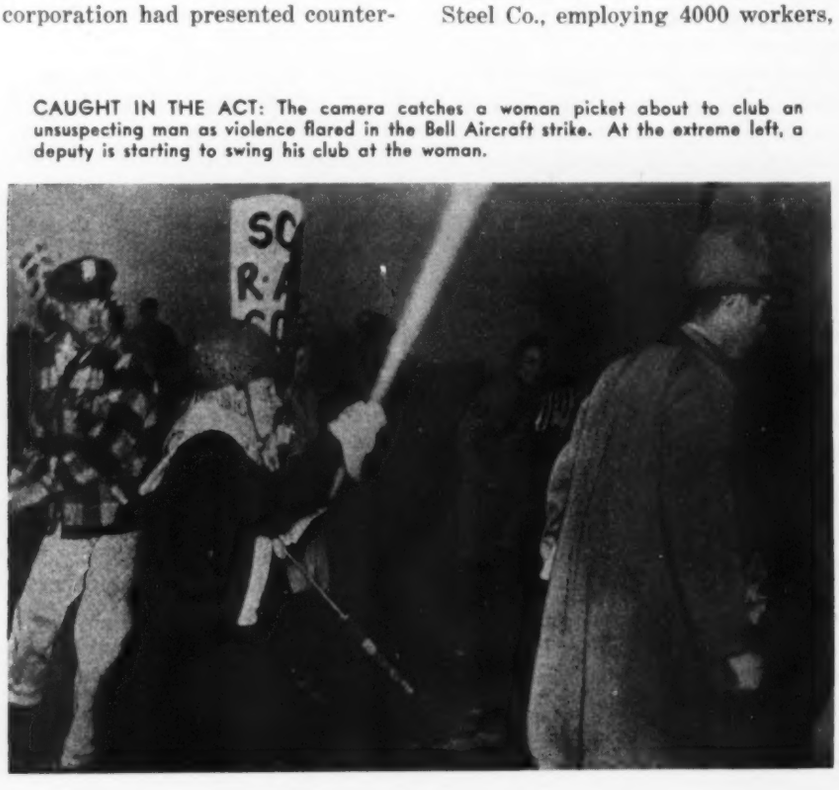
Tuesday, Sept. 27 — While no comment was made by the negotiators, reports circulated that the corporation had presented counter-proposals on insurance and pensions, contributory, and that the offer had been received coolly by the union.

Wednesday, Sept. 28—The corporation announced that it had offered the union contributory pension and insurance programs for its members calling for company contributions of up to 6¢ for pensions and 4¢ for insurance, as recommended by the fact-finding board. The union promptly rejected the offer because it called for worker contributions, asserting that the proposal would amount to a wage cut in disguise for its members. The union countered with an offer to sign a supplemental agreement calling for non-contributory insurance and pension programs, with payments retroactive to July 16, 1949, and a withdrawal of the union's original wage increase demand. Meanwhile, in Washington, Cyrus Ching, director of the Federal Mediation and Conciliation Service, dispatched mediators to 45 companies to assist in negotiations. William N. Margolis and Peter Seitz were assigned to the U. S. Steel negotiations.

Thursday, Sept. 29—The union announced that the Portsmouth Steel Co., employing 4000 workers, had signed the supplemental agreement calling for non-contributory pensions and insurance. It was apparent that negotiations with "big steel" were getting nowhere, and Mr. Margolis asked both sides to meet with him Friday in an eleventh-hour attempt at a settlement. The negotiators agreed.

Friday, Sept. 30—With the strike deadline only hours away, there was little hope from the start that the efforts of the mediators would be successful. Nevertheless the mediators shuttled all day between the two groups, conferring meanwhile by telephone with their Washington headquarters. In the late afternoon, about 6 hours before the strike deadline, Mr. Margolis indicated the hopelessness of the situation when he said: "We are now trying to settle the strike." At 8:30 p.m. Philip Murray announced "the strike is on."

CAUGHT IN THE ACT: The camera catches a woman picket about to club an unsuspecting man as violence flared in the Bell Aircraft strike. At the extreme left, a deputy is starting to swing his club at the woman.



Baldwin Gets Turbine Order

Philadelphia—The Baldwin Locomotive Works here has received an order from the U. S. Army Engineers, Bismarck, North Dakota, for three 88,000-hp hydraulic turbines for installation at Garrison Dam, located on the Missouri River about 75 miles north of Bismarck.

This installation is part of the Missouri Valley Development. The total price for the three turbines, including spare parts, amounts to approximately $2,640,000.

Low-Rent Housing Allocated

Washington—Public Housing Commissioner John T. Egan, through the last half of September, set aside or allocated a total of 21,260 additional low-rent public housing units.

The approved reservations are for the first 2 years of the 6-year housing program involving construction of 810,000 units. Total reservations approved through September amounted to 125,000.

Among the larger allocations were 5800 units for St. Louis; 3000 for San Francisco; 2500 for Denver; 1800 for Richmond (Va.); and 1500 for Miami.

Farm Spending Power Seen Holding Firm in Near Future

Spending peak is past but a high level of income is still assured.

Washington—There is little sign to date that farm cash, which has been an important support for the postwar machinery industry, will not continue to be so for some time to come.

Last year, farmers spent 15 pct of their net income, or $3.4 billion, with industry. They bought $800 million worth of tractors, $600 million worth of automobiles, $300 million worth of trucks—and $1.7 billion worth of combines, mowing machines, plows and other varied items of farm equipment.

They now have 5.5 million passenger cars and 2.1 million trucks in operating condition. They have 3.3 million tractors at work in their fields and $5.9 billion worth of other equipment on hand.

Price Support a Big Factor

While some of the factors which brought the postwar boom to the farm equipment field have changed, there are no indications that the market will not remain relatively good in the foreseeable future. One reason is that the boom period of the past decade enabled the farmer to get his indebtedness well in hand. Also, with apparent assurance of continued price support programs for an indefinite period, his relative share of national income seems certain.

Furthermore, many agencies stand ready to help him when he needs credit. These include the expanding cooperative associations (themselves no small purchasing factor) which have half their net worth, or about $2 billion, invested in credit and insurance groups.

Predicts Smaller Income

Despite this optimistic outlook, some of the bloom is gone from the farm equipment market. From here on, dealers and their salesmen will have to dig deeper and work longer to get the business—which the Federal Reserve Board says is still there.

For one thing, the Board warns that the 1949 net farm income is likely to be $2 billion less than last year—or down to about $20 billion. Moreover, the Board figures that the farmer is getting 20 pct less (than postwar peaks) for what he sells. At the same time, the Board figures that the price of what he buys has come down only about 4 pct.

Consequently, with his more pressing needs satisfied, the farmer is now spending more time in looking for what he himself wants instead of what he can get. And he is also ready to do a bit of haggling over prices.

A Special Editorial

The Steel Strike

By TOM C. CAMPBELL

LOST in the shuffle of labor news is the fact that the steel companies gave plenty on insurance and pensions and the union gave nothing. Last July steel firms refused to talk about pensions because they said it was not in the contract. They offered about 2½¢ on insurance. A deadlock occurred.

After the board recommendations all steel companies started to give in terms of the board's suggestions—except on the matter of outright noncontributory plans. That was a principle. Many steel firms agreed to put up the money for insurance and pensions mentioned in the board report.

We bring this up because someone is going to be blamed for the strike. There should have been no strike. It is queer that steel firms should be expected to come all the way with no give on the union side and still have negotiations called collective bargaining.

From the record it is clear that the steel industry did reconsider and give serious weight to the Steel Fact-Finding Board's report. They did offer time and again the money amounts recommended by the board. They went much further than generally expected. They tried to bargain. The union stood pat on all counts and said "No! We want complete agreement with noncontributory principle."

There should be no question of the responsibility for this steel strike. It rests with the officers and the policy committee of the United Steelworkers of America.

Germans Study U.S. Methods

Washington—Arrangements have been made for a team of six German technicians to spend 2 months in the United States studying production and use of agricultural machinery and equipment.

Building Costs Drop 5 Points

Cleveland — Industrial building costs dropped another 5 points to 161 (1926 equals 100) during the third quarter as the result of continued improvement in the quality of construction labor and in the availability of building materials and equipment, according to the Austin Co.'s Index. The current index figure is 7½ pct below the peak reached in October 1948. It compares with the level prevailing from April to September of 1947.

"This reduction in building costs has taken place in the face of scattered wage increases and the further small advance in freight rates," George A. Bryant, Austin president, said. "It would not have been possible without steadily increasing output per man in practically all of the trades, and our ability to get all of the required materials more promptly than in the past."

INDUSTRIAL SHORTS

INFO FREE — The TIN RESEARCH INSTITUTE INC., 492 W. 6th Ave., Columbus, Ohio, has been organized to provide free technical service to users of tin in the United States. R. J. Nekervis has been appointed supervisor of metallurgical development and R. M. MacIntosh supervisor of chemical development.

ATTENTION MEEHANITERS! —It has been announced that representatives of all the manufacturers of MEEHANITE castings in the United States and Canada will convene at the annual Meehanite research meeting on Nov. 2-5 at the Hotel Carter in Cleveland.

HAPPY ANNIVERSARY—The RENSSELAER POLYTECHNIC INSTITUTE, Troy, N. Y., will celebrate its 125th anniversary this year from Oct. 13 to 15.

EXCELS — The John Fritz medal for 1949, the highest award in the engineering profession, has been awarded to WALTER HULL ALDRIDGE. Mr. Aldridge has been president of the Texas Gulf Sulphur Co. for more than 30 years.

BUDD BUILDS — Announcement has been made that a foundry will be erected in Philadelphia by the BUDD CO. costing approximately $1.5 million. The new plant will furnish gray iron castings for other divisions of the company.

ECLIPSE IN CANADA — Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J., has appointed the HOLDEN CO., LTD., Montreal, as exclusive Canadian sales agents for Eclipse seamless flexible metal hose.

NEW MONIKER — The John Nooter Boiler Works Co., steel and alloy plate fabricators, St. Louis, has changed its name to the NOOTER CORP.

SOMETHING NEW — The FAFNIR BEARING CO., New Britain, Conn., has announced the development of a series of normal and heavy-duty spherical roller bearing pillow blocks. Spherical roller bearings for these units will be manufactured by the Torrington Co., Torrington, Conn.

GOING UP—Shipments of porcelain enameled steel plumbing fixtures for the second quarter were worth $9.1 million, an increase of $1.5 million, or 19 pct over the first quarter, were reported by the PORCELAIN ENAMEL INSTITUTE, Chicago.

LIAISON — David C. Minton, Jr., assistant to the director of BATTELLE INSTITUTE, Columbus, Ohio, has been named executive in charge of sponsor relations and projects development.

BUYS FEED-O-MATIC — The V & O PRESS CO., division of Rockwell Mfg. Co., Hudson, N. Y., has purchased the patents, patterns, tools and other equipment, together with the inventory and all assets of a punch press feeding device, the Feed-O-Matic, from the Covert Mfg., Troy, N. Y.

MARKETING MACHINES—A new company, AMERICAN PULLMAX CO., INC., Chicago, has been formed to handle the sales and service of the new Pullmax sheet steel and plate machine. Officers are Stellan Bendz, president and E. G. Kihlstrom, sales manager.

IN NEW POST — Wilhelm Spannhake, a specialist in the design and construction of turbomachinery, has joined the staffs of ARMOUR RESEARCH FOUNDATION and the Graduate school of ILLINOIS INSTITUTE OF TECHNOLOGY, Chicago.

Port of Boston Authority Will Handle Steel Plant Site

Boston—The office of Gov. Paul Dever of Massachusetts last week announced plans to place the Port of Boston Authority in charge of any waterfront site that may be selected for a steel plant to process Labrador ore.

Gov. Dever, who is in Europe, instructed his staff by transatlantic telephone to begin forming a committee to induce steel interests to locate on the Massachusetts coastline. Legislation has already been drafted authorizing the Port of Boston Authority to take over the waterfront area near any site that may be selected. This move would open the way for an established state agency to carry out dredging and other tidewater improvements needed.

John T. Fallon, manufacturers' agent for Pittsburgh steel mills told a gathering of about 40 people in Mayor Curley's office that a steel plant would use up considerable property but the benefits would be "fantastic." The mayor appointed a special committee of those present to assist in locating a steel plant near Boston.

Two possible sites are already under consideration. One is near the Lynn, Mass., General Electric plant. The other is the Hingham, Mass., Shipyard. Both are near Boston.

Strike Time Loss Decreases

Washington—While there were 120 more strikes during the first 8 months of 1949 than for 1948, the Labor Dept. reports that there were 370,000 workers involved and 8.1 million less work days lost.

With exception of the Chrysler and Goodrich disputes (32,000 workers), most of the strikes begininng in August were small and scattered. There were 375 begun during the month.

Counting hold-overs from July, total strikes in progress at one time or another during August were 550, taking out 250,000 workers and causing a loss of 2 million days of worktime.

NEWEST ADDITION: The Phoenix Apollo Steel Co., Phoenixville, Pa., is the latest subsidiary acquired by the Barium management.

Barium Forges Little Steel Empire

Since beginning in 1936 Barium has acquired many plants producing a wide range of products . . . Company stakes its future on efficient management—*By JOHN ANTHONY*

Phoenixville, Pa.—The purchase of the steel plant and its fabricating subsidiary here by Barium Steel Corp., New York, was consummated recently by the payment of the balance of the total purchase price of $1,950,000 for both plants, property and inventories. The steel plant will operate as the Phoenix Iron and Steel Co., a wholly owned subsidiary of Central Iron and Steel Co., Harrisburg, Pa., which was acquired by Barium in 1946. Phoenix Bridge Co. will continue to operate under that name as a subsidiary of Phoenix Iron and Steel Works Co.

The Barium management, headed by Joseph A. Sisto, chairman, and Rudolph Eberstadt, president, plans to modernize the Phoenixville blooming mill and improve the rolling facilities. Soaking pits, construction of which had been started by Kaiser-Frazer Corp., the previous owner, will be completed. The management also expects to expand the activities of the Phoenix Bridge Co.

The Barium story begins in 1936 with the acquisition of a plant at Canton, Ohio, with the object of producing stainless steel in small, shallow-bottomed openhearth furnaces. Owing to the recession which took place in 1938, the plant became inoperative from 1939 to 1941.

Barium Began In 1936

In 1942 operations were resumed through capital supplied by outside sources and facilities supplied by the government. The operation was changed from that of the production of stainless steel to a large and modern flat die forging company. Now operating as a subsidiary, the forging company is Barium Steel & Forge, Inc.

Beginning in 1944, the management began to expand its operations by acquiring plant after plant producing a wide range of steel products. The first acquisition was the Clyde Iron Works, Inc., Duluth. This was followed by Erie Bolt & Nut Co., Erie, Pa., and Globe Forge, Inc., Syracuse, N. Y.

Through an exchange of stock, Republic Industries, Inc., a holding and management company, was acquired. This company owned or controlled Geometric Stamping Co., Cleveland; Porcelain Steels Corp., Cleveland; Kermath Mfg. Co., Detroit, and its Canadian subsidiary; and Jacobs Aircraft Co., Pottstown, Pa., subsequently sold.

Pipe Mill for Harrisburg

Additional acquisitions include the Cuyahoga Spring Co., Cleveland, and the Wiley Mfg. Co. with plants at Port Deposit, Md., and Mountville, Pa.

In 1946, the company acquired Central Iron and Steel Co., Harrisburg, Pa., a steel plate producer whose present annual capacity is estimated at 350,000 ingot tons and 250,000 tons of plate. A new blooming mill at that plant has been substantially completed, together with the necessary soaking pits, shears and other equipment. The management is now considering the installation of a welded pipe mill to produce pipe from steel plate in sizes from 6 in. to 20 in. diam.

Other acquisitions include the Detroit Steel Casting Co.; the

Turn to Page 152

Gets RFC Money

New York — Barium Steel Corp. reported last week that the Reconstruction Finance Corp. had made its first disbursements on two loans totaling $6,250,000 to Central Iron & Steel Co., Harrisburg, Pa., a wholly owned subsidiary of Barium Steel Corp. Part of the loans was to supply funds to Central to buy Phoenix Bridge Co. and Phoenix Iron Works Corp. The balance of the loan will be used for the improvements described in the accompanying article.

SIGNING FORD CONTRACT: John S. Bugas (second from right, seated), Ford Motor Co., vice-president in charge of industrial relations, looks over the new contract that was signed last week giving Ford workers over 65 a $100 monthly pension, including social security. Seated, left to right, are: Ken Bannon, national UAW Ford director; Walter Reuther, president of the CIO United Auto Workers; J. Bugas; and Mel Lindquist, Ford manager of industrial relations.

Ford Agrees on Non-contributory Pensions

Workers with 30 years' service may retire at 65 with $100 per month . . . Plan may help set pattern.

Detroit—Ford and the United Auto Workers (CIO) signed a historical pension agreement here this week that will greatly influence, if it does not actually set, the wage pattern for 1949. Many observers also feel that the Ford agreement will definitely swing the pendulum strongly in favor of non-contributory pensions. Ford has made it clear that after a study of both types the company regards the non-contributory type as most desirable from management's point of view.

The Plan In Brief

It has been estimated that Ford will pay about $20 million a year into the pension fund covering its 115,000 hourly rated employees.

Principal provisions of the pension agreement are:

(1) Workers with 30 years' service may retire at 65 with a pension of $100 a month, including federal social security benefits.

(2) Retirement is compulsory at 68. There is no increase in benefits after 65.

(3) An employee with 30 years service may retire at 60 with the company's permission. His pension benefits are reduced proportionately.

(4) Employees with 25 years' service at age 65 will receive 5/6 of the $100 monthly benefit.

(5) Employees may retire because of total disability at 55 and receive a flat retirement benefit of $50 per month.

(6) If social security benefits go up, the Ford benefits will be reduced proportionately.

(7) The company retains the sole right to select a bank or trust company to administer the funds.

The pension plan may not be reopened for negotiations until March 1, 1955. At no time prior to that date will either side be required to bargain on pensions. There is specific agreement that neither party will resort to a strike, lockout or other economic force to change the present pension plan.

Ford has agreed to improve its present hospitalization benefits and provide up to $4 a day for a maximum of 70 days.

Most observers believe the pension plan was adopted in essentially the form proposed by Ford. An exception may be the reduction in retirement from age 68 to 65.

Barium Steel Empire

Continued from Page 151

Bayonne Bolt Corp., Bayonne, N. J., and Sheffield Iron & Steel Co., a gray iron foundry at Sheffield, Ala.

In all these operations, Barium Steel Corp. acts as a management and holding company. Each subsidiary operates as a separate unit under its own management. But the parent company maintains a staff of engineers and technical experts to advise and assist the subsidiary managements.

Management Gets Results

Within the last 4½ years the Barium group has grown from a three company operation with net sales of $4,725,000 to a 19 company operation with net sales of $51,258,000 in 1948. Net sales in the first 6 months of 1949 were $21,330,469, compared with $24,535,680 in the same period last year.

Skeptics of the steel industry, recalling the precarious financial histories of the Harrisburg plate producer and the Phoenixville shape producer, have been openly dubious of the prospect for profits in a competitive market. Aggressive management of the company and efficiencies resulting from improvements to plant equipment and coordinated operation undoubtedly play a part. Time, alone, will provide the final answer.

A Steel Mill Applies Operation Shutdown

No rough stuff during the halt of all steelmaking facilities . . . Operations carefully planned . . . Maintenance crews permitted to come and go—*By D. I. BROWN*

Gary—At 12:01 a. m., Oct. 1, the quietest strike on record occurred—no enthusiasm, no anger, no sound trucks, no rough stuff. The guy whose old age security and welfare has been a political football since May was just grim—and out of a job.

They walked out but their hearts weren't in it. Many of them asked to stay, "Hide us somewhere . . . we'll work as long as you want us to." For the 2 days before, every newscast brought a hush over crowded lunchrooms and bars close to the main gate of the world's largest steel plant. In the mill canteens the new freezer, the kids' winter stuff crept into the low conversations—10¢ pensions, non-contrib didn't come up.

SHUTDOWN TIMETABLE

START	FINISH
Coke Plant—1132 ovens	
Wed.—8 p.m.	Fri.—7 p.m.
Blast Furnace—11 units	
Thur.—7:20 a.m.	Fri.—10:30 a.m.
Openhearths 50 furnaces	
Thur.—12 m. (noon)	Fri.—4:30 p.m.
Primary Mills—	
36 in. Slabbing	Thur.—12 m. (midnight)
Rail Mill	Fri.—9 a.m.
40-in. Bloomer	Fri.—4 p.m.
Continuous Billet	Fri.—4 p.m.
44-in. Bloomer	Fri.—4 p.m.
Merchant Mills—13 bar mills	
Wheel and axle mill.	
Thur.—8 p.m.	Thur.—12 m. (midnight)

Start to finish elapsed time of shutdown is 47 hr.

Shutdown Well Planned

Gary Works of the Carnegie-Illinois Steel Corp. took 47 hr to rush to a precision-like halt. Early Wednesday it was roaring along at an even 100 pct rate, Friday evening found it at zero. The complex operation was so well planned that only 110 net tons of iron, the last cast of No. 6 blast furnace, had to be pigged. The plant was flat 5 hr before the deadline. This was the planned tolerance to allow room for any unforeseen difficulties. There weren't any.

The coke plant led off, see table, by 7 p. m. Friday all gas lines had been purged with steam. This was done to preclude any air, gas mixtures which might cause explosions. Sealing of oven doors continued up to midnight. The coal filled ovens are being underfired with natural gas and will be kept at 1600°F to prevent damage to the silica brickwork. This, the first time in the history of the Gary plant that all coke ovens have been taken off. The merchant mills had to start down with the coke ovens as the gas is used to fire the heating furnaces and to run power generating equipment.

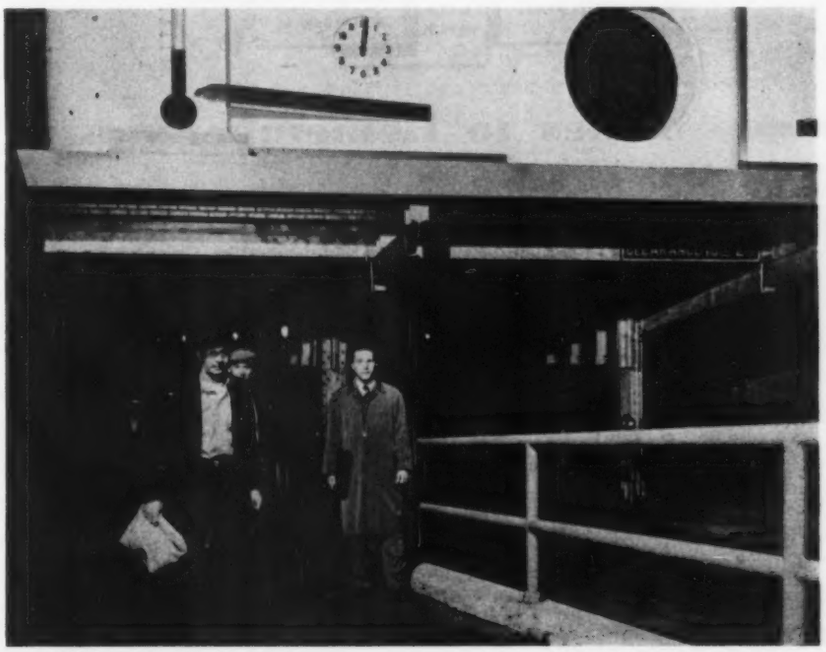
Preparations Began Thursday

The 11 blast furnaces, giant prima donnas of the industry, started down early Thursday. Six were banked that day and the other five were tapped Friday. As these units came off the blowing engines went down, as they are fired by blast furnace gas. A standby steam turbine was used to bring down the last furnace when the regular blowing engines ran out of gas. The furnaces were filled with coke and all the tuyeres removed. These openings were plugged with ganister and bricked up. A clay slurry was sprayed over the entire bosh area to make the furnace as airtight as possible. A wet ore blanket was charged on top of the coke to plug the porous charge and keep the natural draft of the stack to a minimum.

Officials estimated that furnaces are set for a 90-day shutdown if necessary. Steam was piped into the dust catchers and gas lines to prevent explosions. Bleeders were left open at the top of the stack to exhaust any gas generated during the banking period.

The first openhearths shut down were the two tilting duplex units. They came first in order to conserve as much hot metal as possible. Other units followed as the supply of hot iron dried up. It is estimated that six to eight furnace roofs and some of the slag pocket arches will have to be replaced.

LAST TO LEAVE: Iron Age's Chicago editor, D. I. Brown, right, is shown leaving the Gary plant of Carnegie-Illinois Steel Corp. with the final shift after spending 16 hr in the plant covering shutdown operations.



Aid for Underdeveloped Areas Receives a Setback

Washington—President Truman's demand for $45 million worth of aid to underdeveloped areas of the world got a chilly reception from Congress last week.

But Democratic leaders are confident that at least a part of the proposed program can be enacted next year. They believe legislation to carry out the so-called Point Four program can be rammed through on the basis of the stop-Communism appeal of the measure.

The two basic elements of the Point Four program are technical assistance and the investment of capital. Foreign investment would be stimulated, under the provisions of the bills now under consideration, by government guarantee against loss. Direct technical assistance would be extended in the fields of production, agriculture, health, and education.

Geographically speaking, the program would be extended to most parts of Latin America, the Middle East, the Far East, and Oceania. Marshall Plan countries would be excluded since the White House planners regard the proposed venture as one designed to supplement the European recovery program.

Aluminum Workers Vote for CIO

Pittsburgh—The American Federation of Labor has lost its attempt to take over as bargaining agent for some 3800 production workers in New Kensington district plants of Aluminum Co. of America.

In a National Labor Relations Board election recently the CIO United Steelworkers of America retained the right to represent the workers by a 5-to-1 margin.

Sweden Will Build Locomotives

Chicago—Electro-Motive Div. of General Motors Corp. has concluded an agreement with Nydqvist & Holm Aktiebolag of Trollhattan, Sweden, for the manufacture of diesel-electric locomotives. Under the agreement the Swedish concern will market Electro-Motive's 567B type diesel engines and other transmission parts manufactured and supplied by GMC.

Resistance Welding Sales Jumped 81 Pct During August

Cleveland—August sales of resistance welding machines were 81 pct ahead of July, the Resistance Welding Institute reported last week. During the same period actual shipments rose 70 pct, cancellations dropped more than 12 pct, and shipments of electrodes increased 20 pct.

The unpredicted increase in sales brings to an end a steady decline which began earlier this year, the Institute said. Resumption of large scale purchases of resistance welders is viewed by the industry as assurance that metal fabricating industries are planning aggressive development of consumer markets.

Examples of this trend were cited in the actions of the automotive, refrigeration, stove, television and appliance industries, which contemplate near record production quotas for the last quarter of the year.

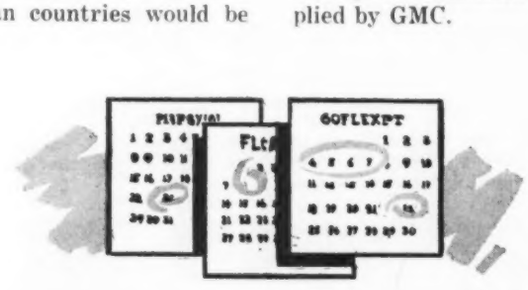
Dutch Government Approves Program to Increase Exports

Washington—Recently stepped up efforts of the Dutch to increase exports to the dollar areas has received full approval of the Economic Cooperation Administration.

Dutch plans involve an export drive which is to be promoted entirely by private concerns with Netherlands government backing and supervision. Export associations will be formed by Dutch manufacturers of identical or related products.

The government will then allow 10 pct of the net dollar proceeds to be used by the Dutch exporters for purchase of foreign products to be imported. There will be four Dutch trade commissioners stationed in the U. S. to assist the program.

One will be located in Los Angeles and another in Chicago. A third will be stationed in the South, either New Orleans, Dallas, or Houston. The fourth office site has not been announced.



Dates to Remember

Oct. 10-14	**American Society for Testing Materials,** West Coast meeting, San Francisco.
Oct. 11-14	**American Standards Assn.,** annual meeting, New York.
Oct. 12-15	**Electrochemical Society,** semiannual meeting, Chicago.
Oct. 13-15	**Foundry Equipment Manufacturers Assn.,** annual meeting. White Sulphur Springs, W. Va.
Oct. 17-20	**American Gas Assn.,** annual convention, Chicago.
Oct. 17-21	**National Metal Congress,** Cleveland.
Oct. 24-26	**American Gear Manufacturers Assn.,** annual meeting, Chicago.
Oct. 26-28	**National Metal Trades Assn.,** annual convention, Chicago.
Oct. 27-28	**Gray Iron Founders Society,** annual meeting, Chicago.
Oct. 27-28	**Porcelain Enamel Institute,** annual meeting, French Lick, Ind.
Oct. 27-29	**American Society of Tool Engineers,** semiannual meeting, Montreal.
Oct. 30-Nov. 2	**National Tool & Die Manufacturers Assn.,** annual meeting, New York.
Oct. 31-Nov. 3	**American Institute of Steel Construction,** annual convention, White Sulphur Springs, W. Va.
Nov. 10-11	**National Foundry Assn.,** annual meeting, New York.

British Foundry Team Criticizes Methods

Report declares U. S. Steel foundries are 50 to 90 pct more productive than British . . . American machines and methods are given most of the credit.

New York — The British steel foundry team that toured steel foundries in this country last spring under the auspices of the Economic Cooperation Administration has stated that productivity is 50 to 90 pct higher in the steel foundry industry of the U. S. than in Britain. Published by the Anglo-American Council on Productivity, the report is one of the sharpest criticisms ever made by Britons of their own production methods.

It itemizes in detail the technological basis for this finding. But it also contains a good deal of information on the psychological basis for the high rate of U. S. productivity. The presentation of some of the observations of the team serves to emphasize some differences in viewpoint found in industry and labor across the Atlantic.

The team reports that there is a widespread degree of productivity-consciousness here. Emphasis is found to be more on output per man than on total output for the plant.

Incentives Are Noted

At all levels incentives are in evidence, the report says. Monetary incentives are reported to be truly effective because taxation is not so severe as to nullify the extra reward for the extra effort. Also, there are consumer goods available to absorb the extra wages that can be earned by a high output.

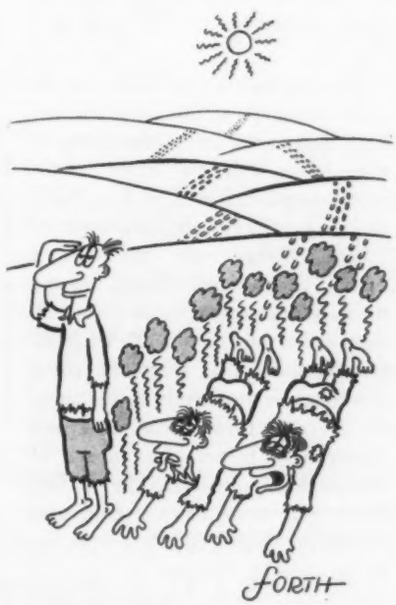
Competition is the governing factor throughout American industry. Steel castings have to compete with weldments and drop forgings, as well as with other materials. Within the steel foundry geographical groups, competition is intense for the business in the district. Price cutting becomes the rule when business levels fall. The inadequacy of many of the cost accounting systems suggests that this could well become cut-throat competition without benefit to the industry or its customers.

Competition is also keen at supervisory levels, the team reports. These jobs bring the most earnings and continuity of employment. Since becoming a supervisor is dependent only upon ability and energy, there are many would-be entrants ready to take the places of those who fail to make the grade.

Machines Are the Answer

The team reports this leads to lower costs and high productivity. The principle is supported with vigor by Americans who accept as a part of everyday life any result of competition. Opposition to a move designed to increase productivity is rare, even if it serves to intensify competition.

The report says that the physical basis of high productivity is the use of machines. Factory layouts are based on the economical space relations of machines and the men to work them, so as to simplify the flow of materials, reduce the movement of workers from their place of work, and reduce the call upon labor not directly engaged in productive processes.



"The heat doesn't bother him—he worked in a foundry."

Labor Fully Utilized

The use of machines calls for more power per man. This involves the elimination of a major part of hand operations, provision for mechanical handling, and designing to make the maximum use of machinery. The readiness of the American worker to accept new machines, new methods and the use of new materials is most evident. There are no outworn prejudices to be overcome, but rather an overenthusiasm for what is novel.

Since labor is expensive, the best possible use is made of it. Jobs are organized in such a way that men are kept at a steady pace of production throughout the working day, skilled men being confined to skilled work and fully serviced by lower grade men. Similarly, skill is taken away from the operators of machines who are required instead to develop deftness.

The type of labor best adapted to serve machines is that which thinks not how the product ought to be made, but only how the movements of production can be fitted into a pattern or rhythm. Skill of a high order is retained as knowledge which may be entirely divorced from performance of any manual operation.

Castings are required to be functionally adequate. Perfection is not a factor where it has no functional significance. Tolerances and limits are no closer than to meet the service required.

Pakistan Plans First Shipyard

Washington—Plans are well advanced for construction of a Pakistan shipyard, the country's first, at Karachi. It will be capable of building seagoing vessels up to 10,000 tons. Construction will be supervised by Scotch shipbuilding experts.

Viewing the News from

The ECONOMIC SIDE

By JOSEPH STAGG LAWRENCE

"Another Secret Deal"

WHEN Sir Stafford rose in the House of Parliament on a Sunday evening in September to tell the world that England, aided by the United States, could no longer maintain a false value for the pound, he was making history. He got all the headlines. Yet another event had taken place only 5 days before which in the end may prove to be the more momentous.

On the 13th of September an angry finance minister from the Union of South Africa rose before the Governors of the International Monetary Fund in Washington and delivered an ultimatum. The press did not mention this and we became aware of it only when the South African Embassy sent us a copy of the speech.

Nicholas Havenga, the spokesman for the greatest gold producing area in the world, went back 5 years to the discussions preceding the Bretton Woods agreement. The financial representatives of the allied nations, under the leadership of the English, gathered to weigh means of "stabilizing" their currencies after the war. They knew that the vast destruction entailed by war, the universal increase in public debt, the enormous increase in paper currency and bank credit, would be followed inevitably by inflation. Each one of them also knew that the "social and economic" measures which they would inaugurate, in order to hold power within their own countries, would carry into the period of peace the highly inflationary fiscal practices necessary during war.

None of these statesmen wanted to expose his own currency to the cruel appraisal of open markets. Such markets would measure the real depreciation of money more accurately than domestic price indices, loaded, as they are, with rigged prices. The mechanism they set up could function only temporarily. In the interval the sovereign providing the basic currency, namely the dollar, must provide substantial amounts of his own currency to support the phony money scales. A further condition—and this was basic—called upon the gold producers to accept a fixed price for their product while other prices were going up.

These gold producers knew that they were being asked to make the sacrifices which would enable finance ministers, bent on monkey business, to postpone the day of reckoning. The representatives of South Africa, Australia, Canada—the great gold producers—knew the score and objected vigorously. This is where Nicholas Havenga, the Finance Minister of South Africa and the 13th of September, Washington, come in. Mr. Havenga said a deal was made at Bretton Woods—one of those unwritten, behind-the-barn gentlemen's agreements. This deal called upon the signatories to undertake a universal devaluation of all currencies in terms of gold whenever inflation, due to war and the fiscal practices of member states, caused costs to rise to the point where they became intolerable for the gold producers.

Mr. Havenga served notice on the other members of the fund that the time had come for performance in accordance with the terms of the unwritten pact. Five days later came the d r a m a t i c announcement of Cripps. Today only the United States, Switzerland, Brazil, among the important countries of the world, have failed to follow suit. What all this means is that when the going gets tough competitively in this country and our production level and employment reflect the impact of worldwide devaluation, the United States will again cut the gold content of the dollar. Give it a year, or, at the outside, 2 years.

Expects 20 Million Tons High-Grade Liberian Iron Ore

Washington — Development of upwards of 20 million tons of high-grade Liberian iron ore is expected to result from a joint investment of Republic Steel Co. and the Export-Import Bank, Congress was told recently.

Last April the Bank extended a $4 million credit to the Liberian Mining Co. after about $1 million in private American capital had already been invested in the Bomi Hills property.

Republic agreed to put up the remaining $3 million necessary for development. The steel firm has signed a long-term contract for a substantial portion of the annual output from the property.

Indications Point to A Prolonged Coal Strike

Pittsburgh—The signs point to a prolonged coal strike. Negotiations at Bluefield and White Sulphur Springs, W. Va., have been that in name only. John L. Lewis, president of the striking United Mine Workers of America, failed to show up at sessions last week, due to the illness of his mother. Operator spokesmen were openly discouraged. Mr. Lewis has not yet made formal demands on the industry.

The steel strike makes a settlement in coal less urgent.

This week, 78,000 hard coal miners and 22,000 bituminous miners west of the Mississippi returned to their jobs on orders of the UMW chieftain, but 380,000 soft coal miners in northern and western pits continued their strike into the third week.

Violence in Coal Fields

Violence marked the walkout in the western Pennsylvania fields as roving pickets sought to shut down non-union operators in that area last week. Prompt police action and the fact that non-strikers took to carrying sidearms and rifles had minimized such tactics at the week's end.

Briefs and Bulletins

forecast—The devaluation of the Canadian dollar which set Canadian aluminum ingots at 14.10¢ U. S. forecasts a prospect of stockpiling cheaper Canadian aluminum if the Munitions Board should place the metal on the strategic list. At present, bauxite is being stockpiled, supplemented by about 60 million lb of aluminum in the form of barter as payment for the lease or sale of war-built plant.

deliveries—A poststrike check shows that most mills were able to maintain delivery schedules very close to advance promises, although there were occasional reports that shipments had fallen behind schedule. Usually, when this happens, it is due to a shift in customer quotas. Every company which had registered a complaint admitted that it may be due to pressure brought by the largest steel users on their mill suppliers.

for sale—Sealed bids for purchase of the wartime Chance Vought Aircraft plant at Stratford, Conn., will be accepted by the Office of Surplus Property (General Services Administration, Washington) until Nov. 21. The square footage of plant space includes: Shops, 917,000; offices, 393,000; hangars, 81,000; and service, 59,000.

auto record—Latest statistics compiled by R. L. Polk & Co., Detroit, indicate more than half a million cars will be titled during August to set a new postwar record. Polk said August will be the second highest month in the history of the auto industry. The all-time record was established in May 1941 when 515,034 new cars were licensed.

steel lag—Some steel using industries will be harder hit than others by the strike, but most will be yelling "uncle" within 3 weeks. Even if a settlement is made in 3 weeks it will be 10 more days before steel is rolling to plants in big volume.

steel shortage—After the strike is settled steel will be scarce again. Everyone will want what he couldn't get yesterday. Those lucky firms who had enough steel to weather the strike may find that they can't get enough to keep the same schedule.

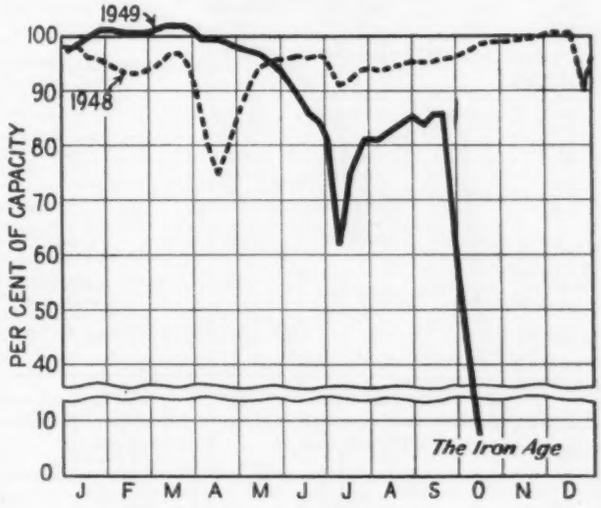
underground—Federal approval has been granted The Ohio Fuel Co. to expand its underground storage facilities by 16.6 billion cu ft as a reserve for winter demand. The work involves construction of 60 miles of pipeline.

back to work—Workers at Eastern Stainless Steel Corp., Baltimore, went back to work last week after a strike lasting 4 weeks. The settlement with the union included a wage increase of 5½¢ an hr, bringing the new rate to $1.13. The company will pay the full cost of a health and life insurance program of which 46 pct of the cost had previously been borne by employees. There is no pension payment in the settlement.

fabricated shipments—Estimated total shipments of fabricated structural steel for August increased to 172,165 tons from 143,561 tons in July and 176,306 tons in August 1948, according to American Institute of Steel Construction. August bookings declined sharply to 97,503 tons from 125,601 tons in July and was well under the 172,485 tons booked in August of last year.

mystic pig iron—The Mystic Iron Works will increase the price of its pig iron 50¢ per ton, f.o.b. Everett, Mass., for fourth quarter delivery. The quarterly price of Mystic pig iron is based upon production costs of a preceding 3-month period excluding the month immediately prior to the period involved.

Steel Operations



District Operating Rates—Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
Sept. 25	79.5*	81.0*	86.5	85.0	92.0	79.5	95.0	84.0*	68.0*	71.5	77.0	80.0	91.5	70.0*
Oct. 2	3.5	5.5	.....	7.0	.....	.....	63.5	4.0	.....	20.0	40.0	30.0	22.1	8.0

* Revised.

Structural Steel Shipments Rise

First 8 months' shipments totaled 1,322,803 . . . Figure is over corresponding 1948 period . . . Bookings down.

New York—The estimated total shipments of fabricated structural steel for the month of August, according to reports received by the American Institute of Steel Construction, Inc., totaled 172,165 tons. Shipments for the first 8 months of the year have totaled 1,322,803 tons as compared with 1,302,745 tons for the corresponding months of 1948.

Bookings for the month totaled 97,503 tons, a decline from the 125,601 tons reported for July.

The backlag (tonange available for future fabrication) for the next 4 months only, stands at 582,-798 tons.

The complete tabulation of bookings and shipments for the 8-month period is as follows:

	Estimated Total Tonnage for the Entire Industry		
	1949	1948	Ave. 1936/1940
CONTRACTS CLOSED			
Jan.	130,418	160,634	107,578
Feb.	108,764	130,119	96,280
Mar.	149,079	213,123	124,558
Apr.	98,802	154,082	110,783
May	116,975	141,764	126,237
June	96,952	162,367	125,835
July	125,601*	177,687	152,481
Aug.	97,503	172,485	113,135
Totals	924,094	1,312,261	956,887
SHIPMENTS			
Jan.	152,746	146,363	92,578
Feb.	145,879	141,536	88,626
Mar.	185,885	167,029	115,031
Apr.	179,206	166,687	123,650
May	171,101	186,915	123,225
June	172,260	157,109	129,969
July	143,561*	160,780	127,422
Aug.	172,165	176,306	136,389
Totals	1,322,803	1,302,745	936,890
TONNAGE AVAILABLE FOR FABRICATION WITHIN THE NEXT 4 MONTHS	582,798	690,724	350,517

* Revised

Fabricated steel awards this week included the following:

735 Tons, Philadelphia, plant for Supplee-Wills-Jones Milk Co., to Max Corshin, Philadelphia.

334 Tons, Berks County, Pa., Pennsylvania Dept. of Highways LR 149, through C. W. Good, Inc., Lancaster, Pa., to Bethlehem Steel Co., Bethlehem.

125 Tons, Pickens County, Ala., three bridges for Alabama Highway Department, to Virginia Bridge Co., Birmingham.

Fabricated steel inquiries this week included the following:

685 Tons, Providence, Expressway on Hartford Ave to line between Agnes and Troy Sts. and Olneyville Square consisting of earth, embankment work, bridges and service road, includes Plainfield and Magnolia overpasses, Pascoag R.R. temporary trestle, and steel bridge rail for Plainfield pass. Completion date Dec. 31, 1950.

100 Tons, Johnstown, Pa., memorial arena, due Oct. 17.

Reinforcing bar awards this week included the following:

940 Tons, Chicago, Wacker Drive Extension, Hurlihy Midcontinent Co., Chicago, low bidder.

235 Tons, Madison, Wis., West Side Elementary School, J. P. Cullen, Janesville, Wis., low bidder.

115 Tons, La Grange, Ill., physical education building, Coath and Goss, Chicago, low bidder.

775 Tons, Berks County, Pa., Pennsylvania Dept. of Highways LR 141 (8 and 8D), through C. W. Good, Lancaster, Pa., to Bethlehem Steel Co., Bethlehem.

625 Tons, Berks County, Pa., Pennsylvania Dept. of Highways LR 149 (6B), through C. W. Good, Lancaster, Pa., to Bethlehem Steel Co., Bethlehem.

550 Tons, Dauphin County, Pa., Pennsylvania Turnpike (22B), through G. A. and F. C. Wagman, Inc., Dallastown, Pa., to Bethlehem Steel Co., Bethlehem.

450 Tons, Lancaster County, Pa., Pennsylvania Turnpike (25A), through H. J. Williams, York, Pa., to Bethlehem Steel Co., Bethlehem.

400 Tons, Philadelphia, elementary school at Levick and Horrocks Sts., through Ralph S. Herzog, Philadelphia, to Sweet's Steel Co., Williamsport, Pa.

Reinforcing bar inquiries this week included the following:

200 Tons, Huron, S. D., water softening plant.

185 Tons, Alburg and North Hero, Vt., continuous plate girder bridge, with crushed stone mixed-in-place approaches, Route 2, bids due Oct. 7. Completion date, November 1, 1950.

100 Tons, Portsmouth and Newington, N. H., running north to Route 16, R. H. Whitaker, Concord, N. H., construction engineer. Completion date, June 1, 1950.

Expands Structural Facilities

Seattle—Pacific Car & Foundry Co. is spending more than $300,-000 for building and equipment to expand and modernize its structural steel facilities at 120 W. Hudson St., Seattle.

Paul Pigott, company president, states "this is the first step in expanding and modernizing the company's structural steel facilities."

The company believes that the new setup will enable it to handle huge structural jobs that previously had to be sent out of the Northwest as there were no facilities large enough to handle them. This covers such projects as huge dam gates, bridge girders, etc.

The new building will be 85 ft wide, 420 ft long, and will have 35 ft clearance under the several 15-ton overhead cranes.

Latest welding equipment, automatic and the type that straddles the work will be installed, as well as new plate forming and shearing equipment.

Pacific Car has begun construction of the facilities, which are designed, fabricated and erected by the company.

AMERICAN IRON AND STEEL INSTITUTE — **Blast Furnace Capacity and Production—Net Tons** — **August - 1949** (Month)

	Number of companies	Annual blast furnace capacity	Production							
			Pig Iron		Ferro Manganese and Spiegel		Total		Percent of capacity	
			Current month	Year to date	Current Month	Year to date	Current month	Year to date	Current month	Year to date
Distribution by Districts:										
Eastern	12	13,353,580	865,932	7,981,120	22,692	219,314	888,624	8,200,434	78.3	92.2
Pittsburgh-Youngstown	17	26,625,920	1,611,909	15,262,378	16,430	165,958	1,628,339	15,428,336	72.0	87.0
Cleveland-Detroit	6	6,984,600	439,067	4,108,526	-	-	439,067	4,108,526	74.0	88.3
Chicago	7	15,655,390	999,617	8,743,459	-	23,535	999,617	8,766,994	75.2	84.1
Southern	9	5,010,060	336,627	3,125,600	5,777	54,491	342,404	3,180,091	80.4	95.3
Western	4	2,912,300	178,866	1,607,538	-	-	178,866	1,607,538	72.3	82.9
Total	37	70,541,850	4,432,018	40,828,621	44,899	463,298	4,476,917	41,291,919	74.7	87.9

FERROALLOYS

Ferromanganese

78-82% Mn, Maximum contract base price, gross ton, lump size.

F.o.b. Birmingham	$174
F.o.b. Niagara Falls, Alloy, W. Va., Welland, Ont.	$172
F.o.b. Johnstown, Pa.	$174
F.o.b. Sheridan, Pa.	$172
F.o.b. Etna, Clairton, Pa.	$175

$2.00 for each 1% above 82% Mn, penalty, $2.15 for each 1% below 78%.

Briquets—Cents per pound of briquet, delivered, 66% contained Mn.

Carload, bulk	10.45
Ton lots	12.05
Less ton lots	12.95

Spiegeleisen

Contract prices gross ton, lump, f.o.b.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Palmerton, Pa.	$64.00	$65.00
Pgh. or Chicago	65.00	66.00

Manganese Metal

Contract basis, 2 in. x down, cents per pound of metal, delivered.

96% min. Mn, 0.2% max. C, 1% max. Si, 2% max. Fe.

Carload, packed	35.5
Ton lots	37.0

Electrolytic Manganese

F.o.b. Knoxville, Tenn., freight allowed east of Mississippi, cents per pound.

Carloads	28
Ton lots	30
Less ton lots	32

Low-Carbon Ferromanganese

Contract price, cents per pound Mn contained, lump size, delivered.

	Carloads	Ton	Less
0.07% max. C, 0.06% P, 90% Mn	25.25	27.10	28.30
0.10% max. C	24.75	26.60	27.80
0.15% max. C	24.25	26.10	27.30
0.30% max. C	23.75	25.60	26.80
0.50% max. C	23.25	25.10	26.30
0.75% max. C, 7.00% max. Si	20.25	22.10	23.30

Silicomanganese

Contract basis, lump size, cents per pound of metal, delivered, 65-68% Mn, 18-20% Si, 1.5% max. C. For 2% max. C, deduct 0.2¢.

Carload bulk	8.95
Ton lots	10.60
Briquet, contract basis carlots, bulk delivered, per lb of briquet	10.30
Ton lots	11.90
Less ton lots	12.80

Silvery Iron (electric furnace)

Si 14.01 to 14.50 pct, f.o.b. Keokuk, Iowa, or Wenatchee, Wash., $77.00 gross ton, freight allowed to normal trade area; Si 15.01 to 15.50 pct, f.o.b. Niagara Falls, N. Y., $73.50. Add $1.00 per ton for each additional 0.50% Si up to and including 18%. Add $1.00 for each 0.50% Mn over 1%.

Silicon Metal

Contract price, cents per pound contained Si, lump size, delivered, for ton lots packed.

96% Si, 2% Fe	20.70
97% Si, 1% Fe	21.10

Silicon Briquets

Contract price, cents per pound of briquet, bulk, delivered, 40% Si, 1 lb Si briquets.

Carload, bulk	6.30
Ton lots	7.90
Less ton lots	8.80

Electric Ferrosilicon

Contract price, cents per pound contained Si, lump size, bulk, in carloads, delivered.

25% Si	17.00
50% Si	11.30
75% Si	13.50
85% Si	14.65
90-95% Si	16.50

Calcium Metal

Eastern zone contract prices, cents per pound of metal, delivered.

	Cast	Turnings	Distilled
Ton lots	$2.05	$2.95	$3.75
Less ton lots	2.40	3.30	4.55

Ferrochrome

Contract prices, cents per pound, contained Cr, lump size, bulk, in carloads, delivered. (65-72% Cr, 2% max. Si)

0.06% C	28.75
0.10% C	28.25
0.15% C	28.00
0.20% C	27.75
0.50% C	27.50
1.00% C	27.25
2.00% C	27.00
65-69% Cr, 4-9% C	20.50
62-66% Cr, 4-6% C, 6-9% Si	21.35

Briquets — Contract price, cents per pound of briquet, delivered, 60% chromium.

Carload bulk	13.75
Ton lots	15.25
Less ton lots	16.15

High-Nitrogen Ferrochrome

Low-carbon type: 67-72% Cr, 0.75% N. Add 5¢ per lb to regular low carbon ferrochrome price schedule. Add 5¢ for each additional 0.25% N.

S. M. Ferrochrome

Contract price, cents per pound chromium contained, lump size, delivered.

High carbon type: 60-65% Cr, 4-6% Si, 4-6% Mn, 4-6% C.

Carloads	21.60
Ton lots	23.75
Less ton lots	25.25

Low carbon type: 62-66% Cr, 4-6% Si, 4-6% Mn, 1.25% max. C.

Carloads	27.75
Ton lots	30.05
Less ton lots	31.85

Chromium Metal

Contract prices, cents per lb chromium contained packed, delivered, ton lots. 97% min. Cr, 1% max. Fe.

0.20% max. C	1.09
0.50% max. C	1.05
9.00% min. C	1.04

Calcium-Silicon

Contract price per lb of alloy, lump, delivered.

30-33% Ca, 60-65% Si, 3.00% max. Fe.

Carloads	17.90
Ton lots	21.00
Less ton lots	22.50

Calcium-Manganese—Silicon

Contract prices, cents per lb of alloy, lump, delivered.

16-20% Ca, 14-18% Mn, 53-59% Si.

Carloads	19.25
Ton lots	21.55
Less ton lots	22.55

CMSZ

Contract price, cents per pound of alloy, delivered.

Alloy 4: 45-49% Cr, 4-6% Mn, 18-21% Si, 1.25-1.75% Zr, 3.00-4.5% C.

Alloy 5: 50-56% Cr, 4-6% Mn, 13.50-16.00% Si, 0.75 to 1.25% Zr, 3.50-5.00% C.

Ton lots	19.75
Less ton lots	21.00

V Foundry Alloy

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis.. V-5: 38-42% Cr, 17-19% Si, 8-11% Mn.

Ton lots	15.75¢
Less ton lots	17.00¢

Graphidox No. 4

Cents per pound of alloy, f.o.b. Suspension Bridge, N. Y., freight allowed, max. St. Louis. Si 48 to 52%, Ti 9 to 11%, Ca 5 to 7%.

Carload packed	17.00¢
Ton lots to carload packed	18.00¢
Less ton lots	19.50¢

SMZ

Contract price, cents per pound of alloy, delivered. 60-65% Si, 5-7% Mn, 5-7% Zr, 20% Fe, ½ in. x 12 mesh.

Ton lots	17.25
Less ton lots	18.50

Other Ferroalloys

Alsifer, 20% Al, 40% Si, 40% Fe, contract basis, f.o.b. Suspension Bridge, N. Y. Carload	7.40¢
Ton lots	8.80¢
Calcium molybdate, 45-50%, f.o.b. Langeloth, Pa., per pound contained Mo.	96¢
Ferrocolumbium, 50-60% contract basis, delivered, per pound contained Cb. Ton lots	$2.90
Less ton lots	2.95
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Pa., per pound contained Mo.	$1.10
Ferrophosphorus, electrolytic, 23-26%, carlots, f.o.b. Siglo, Mt. Pleasant, Tenn., $3 unitage, per gross ton	$65.00
10 tons to less carload	75.00
Ferrotitanium, 40%, regular grade, 10% C max., f.o.b. Niagara Falls, N. Y., freight allowed east of Mississippi and north of Baltimore, ton lots, per lb contained Ti	$1.28
Ferrotitanium, 25%, low carbon, f.o.b. Niagara Falls, N. Y., freight allowed east of Mississippi and north of Baltimore, ton lots, per lb contained Ti	$1.40
Less ton lots	1.45
Ferrotitanium, 15 to 19%, high carbon, f.o.b. Niagara Falls, N. Y., freight allowed east of Mississippi and north of Baltimore, carloads per net ton	$160.00
Ferrotungsten, standard, lump or ¼ x down, packed, per pound contained W, 5 ton lots, delivered	$2.25
Ferrovanadium, 35-55%, contract basis, delivered, per pound, contained, V. Openhearth	$2.90
Crucible	3.00
High speed steel (Primos)	3.10
Molybdenum oxide briquets, f.o.b. Langeloth, Pa.; bags, f.o.b. Wash., Pa., per lb contained Mo.	95¢
Simanal, 20% Si, 20% Mn, 20% Al, contract basis, f.o.b. Philo, Ohio, freight allowed, per pound Carload, bulk, lump	11.00¢
Ton lots, bulk, lump	11.50¢
Ton lots, packed, lump	11.75¢
Less ton lots, lump	12.25¢
Vanadium pentoxide, 88-92% V_2O_5 contract basis, per pound contained V_2O_5	$1.20
Zirconium, 35-40%, contract basis, f.o.b. plant, freight allowed, per pound of alloy. Ton lots	21.00¢
Zirconium, 12-15%, contract basis, lump, delivered, per lb of alloy. Carload, bulk	6.60¢

Boron Agents

Contract prices, per lb of alloy, del.

Borosil, f.o.b. Philo, Ohio, freight allowed, B 3-4%, Si 40-45%, per lb contained B	$4.25
Bortam, f.o.b. Niagara Falls Ton lots, per pound	45¢
Less ton lots, per pound	50¢
Carbortam, f.o.b. Suspension Bridge, N. Y.; freight allowed, Ti 15-18%, B 1.00-1.50%, Si 2.5-3.0%, Al 1.0-2.0%. Ton lots, per pound	8.625¢
Ferroboron, 17.50% min. B, 1.50% max. Si, 0.50% max. Al, 0.50% max. C, 1 in. x D. Ton lots	$1.20
F.o.b. Wash., Pa.; 100 lb and over 10 to 14% B.	.75
14 to 19% B.	1.20
19% min. B.	1.50
Grainal, f.o.b. Bridgeville, Pa. freight allowed, 100 lb and over. No. 1	93¢
No. 6	63¢
No. 79	45¢
Manganese—Boron 75.00% Mn, 15-20% B, 5% max. Fe, 1.50% max. Si, 3.00% max. C, 2 in. x D, delivered. Ton lots	$1.67
Less ton lots	1.79
Nickel—Boron 15-18% B, 1.00% max. Al, 1.50% max. Si, 0.50% max. C, 3.00% max. Fe, balance Ni, delivered. Less ton lots	$1.80
Silcaz, contract basis, delivered Ton lots	45.00¢

Nonferrous METALS OUTLOOK

Market Activities

Impact of steel strike forecasts lower metals prices . . . Zinc and lead prices reduced . . . Consumers' inventories generally reduced . . . RFC tin price set at 96¢.

by John Anthony

New York—The impact of the steel strike fell like a blow on the metal markets, causing consumers to shun buying of metals. Immediate price reactions occurred Oct. 3 in the zinc and lead markets whose prices dropped by ¾¢ and ½¢ per lb, respectively. The new prices are: Zinc 9¼¢, East St. Louis, 9.98¢. New York; lead, 14.05¢ St. Louis, 14.25¢ New York. The lead reduction followed quickly after a ⅜¢ reduction on Sept. 26.

Strikes Affect Prices

The duration of the steel strike and the coal strike will largely determine future price developments in nonferrous metals. Most steel consumers have attempted to put in inventories of steel in advance of the requirements normal to this market. But the pressure of accelerated demand for some products has prevented the building up of balanced stocks by many consumers. There will be some buying of metals by consumers who are well fixed for steel. But all buying pressure will be off the metal markets while the strikes last.

In the meantime custom smelters will be in no position to take in unlimited tonnages of ores and concentrates on the basis of currently prevailing prices for lead, zinc and copper. It may be expected, therefore, that further price weakness may develop in these metals if the strike continues for any length of time. Mine producing companies may be expected to be unwilling to meet reductions below levels dictated by their costs and will stock their production if the strikes continue.

On the other hand, consumers of metals and mill products have generally reduced their heavy inventories and in many cases are on a hand-to-mouth basis. This will prevent continued absence from the market of consumers who have been fortunate enough to build up steel inventories.

RFC Tin Set at 96c.

The RFC established its price of tin at 96¢ per lb on Sept. 28, after withdrawing from the market for a period of 2 days following the reduction in the British Ministry price to 95¢. During the 2-day period it was not possible to buy spot tin, as only forward shipments were available at the 95¢ price. The 1¢ price difference has been established to encourage heavy consumers to buy direct from overseas producers, thereby permitting RFC to withdraw gradually from the tin market.

NONFERROUS METALS PRICES

	Sept. 28	Sept. 29	Sept. 30	Oct. 1	Oct. 3	Oct. 4
Copper, electro, Conn.	17.625	17.625	17.625	17.625	17.625	17.625
Copper, Lake, Conn.	17.75	17.75	17.75	17.75	17.75	17.75
Tin, Grade A, New York	96.00	96.00	96.00	96.00	96.00	96.00
Zinc, East St. Louis	10.00	10.00	10.00	10.00	9.25	9.25
Lead, St. Louis	14.55	14.55	14.55	14.55	14.05	14.05

Note: Quotations are going prices.

MONTHLY AVERAGE PRICES

The average prices of the major nonferrous metals in September based on quotations appearing in THE IRON AGE, were as follows:

	Cents Per Pound
Electrolytic copper, Conn. Valley	17.625
Lake copper, Conn. Valley	17.75
Grade A tin, New York	81.015
Zinc, East St. Louis	10.045
Zinc, New York	10.765
Lead, St. Louis	14.854
Lead, New York	15.05

Mill Products

Aluminum

(Base prices, cents per pound, base 30,000 lb, f.o.b. shipping point, freight allowed)

Flat Sheet: 0.188 in., 2S, 3S, 26.9¢; 4S, 61S-O, 28.8¢; 52S, 30.9¢; 24S-O, 24S-OAL, 29.8¢; 75S-O, 75S-OAL, 36.3¢; 0.081 in., 2S, 3S, 27.9¢; 4S, 61S-O, 30.2¢; 52S, 32.3¢; 24S-O, 24S-OAL, 30.9¢; 75S-O, 75S-OAL, 38¢; 0.032 in., 2S, 3S, 29.5¢; 4S, 61S-O, 33.5¢; 52S, 36.2¢; 24S-O, 24S-OAL, 37.9¢; 75S-O, 75S-OAL, 47.6¢.

Plate: ¼ in. and heavier: 2S, 3S, F, 23.8¢; 4S-F, 26¢; 52S-F, 27.1¢; 61S-O, 26.6¢; 24S-F, 24S-FAL, 27.1¢; 75S-F, 75S-FAL, 33.9¢.

Extruded Solid Shapes: Shape factors 1 to 4, 33.6¢ to 64¢; 11 to 13, 34.6¢ to 76¢; 23 to 25, 34.7¢ to $1.05; 35 to 37, 44¢ to $1.53; 47 to 49, 63.5¢ to $2.20.

Rod, Rolled: 1.064 to 4.5 in., 2S-F, 3S-F, 24¢ to 30.5¢; Cold-finished, 0.375 to 3.5 in., 2S, 3S, 36.5¢ to 32¢.

Screw Machine Stock: Drawn, ⅛ to 11/32 in., 11S-T3, R317-T4, 49¢ to 38¢; cold-finished, ⅜ to 1½ in., 11S-T3, 37.5¢ to 35.5¢; ⅝ to 2 in., R317-T4, 37.5¢ to 34.5¢; rolled, 1 9/16 to 3 in., 11S-T3, 35.5¢ to 32.5¢; 2⅛ to 3⅝ in., R317-T4, 33.5¢ to 32.5¢. Base 5000 lb.

Drawn Wire: Coiled, 0.051 to 0.374 in.: 2S, 36¢ to 26.5¢; 52S, 44¢ to 32¢; 56S, 47¢ to 33.5¢; 17S-T4, 50¢ to 34.5¢; 61S-T4, 44.5¢ to 34¢; 75S-T6, 76¢ to 55¢.

Magnesium

(Cents per lb, f.o.b. mill, freight allowed Base quantity 30,000 lb)

Sheets and Plate: Ma, FSa, ¼ in., 54¢-56¢; 0.188 in., 56¢-58¢; B & S gage 8, 58¢-60¢; 10, 59¢-61¢; 12, 63¢-65¢; 14, 69¢-74¢; 16, 76¢-81¢; 18, 84¢-89¢; 20, 96¢-$1.01; 22, $1.22-$1.31; 24, $1.62-$1.75. Specification grade higher.

Extruded Round Rod: M, diam in., ⅛ to 0.311, 58¢; ⅜ to ¾, 46¢; 1¼ to 1.749, 43¢; 2¼ to 5, 41¢. Other alloys higher.

Extruded Square, Hex. Bar: M, size across flats, in., ⅜ to 0.311, 61¢; ½ to 0.749, 48¢; 1¼ to 1.749, 44¢; 2½ to 4, 42¢. Other alloys higher.

Extruded Solid Shapes, Rectangle: M, in weight per ft, for perimeters of less than size indicated, 0.10 to 0.11 lb per ft, per. up to 3.5 in., 55¢; 0.22 to 0.25 lb per ft, per. up to 5.9 in., 51¢; 0.50 to 0.59 lb per ft, per. up to 8.6 in., 47¢; 1.8 to 2.59 lb per ft, per. up to 19.5 in., 44¢; 4 to 6 lb per ft, per. up to 28 in., 43¢. Other alloys higher.

Extruded Round Tubing: M, wall thickness, outside diam, in., 0.049 to 0.057, ¼ to 5/16, $1.14; 5/16 to ⅜, $1.02; ½ to ⅝, 76¢; 1 to 2 in., 65¢; 0.065 to 0.082, ⅜ to 7/16, 85¢; ⅝ to ¾, 62¢; 1 to 2 in., 57¢; 0.165 to 0.219, ⅝ to ¾, 54.5¢; 1 to 2 in., 53¢; 3 to 4 in., 49¢. Other alloys higher.

Nickel and Monel

(Base prices, cents per lb, f.o.b. mill)

	Nickel	Monel
Sheets, cold-rolled	60	47
Strip, cold-rolled	66	50
Rods and bars	56	45
Angles, hot-rolled	56	45
Plates	52	46
Seamless tubes	89	80
Shot and blocks	..	40

Copper, Brass, Bronze

(Cents per lb, freight prepaid on 200 lb)

	Sheets	Rods	Extruded Shapes
Copper	31.30	....	30.90
Copper, h-r	....	27.15	....
Copper, drawn	....	28.40	....
Low brass	29.47	29.16	32.38*
Yellow brass	28.19	27.88	31.20*
Red brass	29.89	29.58	32.80*
Naval brass	33.13	27.19	28.44
Leaded brass	....	22.76	26.85
Com'l bronze	30.84	30.53	33.50*
Manganese bronze	36.63	30.54	32.04
Phosphor bronze	50.47	50.72	....
Muntz metal	31.15	26.71	27.96
Everdur, Herculoy, Olympic, etc	36.19	35.14	....
Nickel silver, 10 pct	39.13	41.41	41.44
Arch. bronze	....	....	26.85

*Seamless tubing.

Primary Metals

(Cents per lb, unless otherwise noted)

Aluminum, 99+%, 10,000 lb, freight allowed	17.00
Aluminum pig	16.00
Antimony, American, Laredo, Tex.	38.50
Beryllium copper, 3.75-4.25% Be dollars per lb contained Be	$24.50
Beryllium aluminum 5% Be, dollars per lb contained Be	$52.00
Bismuth, ton lots	$2.00
Cadmium, del'd	$2.00
Cobalt, 97-99% (per lb)	$1.80 to $1.87
Copper, electro, Conn. Valley	17.625
Copper, lake, Conn. Valley	17.75
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.8%, dollars per troy oz.	$2.25
Iridium, dollars per troy oz.	$100 to $110
Lead, St. Louis	14.05 to 14.10
Lead, New York	14.25
Magnesium, 99.8+%, f.o.b. Freeport, Tex.	20.50
Magnesium, sticks, carlots	34.50
Mercury, dollars per 76-lb flask f.o.b. New York	$72 to $75
Nickel, electro, f.o.b. New York	42.93
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per troy oz.	$69 to $72
Silver, New York, cents per oz.	73.25
Tin, New York	96.00
Zinc, East St. Louis	9.25
Zinc, New York	9.98
Zirconium copper, 10-12 pct Zr, per lb contained Zr	$12.00

Remelted Metals

Brass Ingot

(Published prices, cents per lb delivered, carloads)

85-5-5-5 ingot		
No. 115	15.00*	16.50
No. 120	14.50*	16.00
No. 123	14.00*	15.50
80-10-10 ingot		
No. 305	....	21.00
No. 315	....	18.00
88-10-2 ingot		
No. 210	....	27.50
No. 215	....	24.50
No. 245	17.50*	19.75
Yellow ingot		
No. 405	12.75*	14.25
Manganese bronze		
No. 421	....	19.00

*F.o.b. Philadelphia.

Aluminum Ingot

(Cents per lb, lots of 30,000 lb)

95-5 aluminum-silicon alloys	
0.30 copper, max.	18.75-19.00
0.60 copper, max.	18.50-18.75
Piston alloys (No. 122 type)	16.75
No. 12 alum. (No. 2 grade)	15.50-16.00
108 alloy	16.25-16.75
195 alloy	17.25-17.50
13 alloy	18.50-18.75
AXS-679	16.50-16.75
5% Ti, Aluminum, f.o.b., Eddystone, Pa.	
Low copper	31.00
2% copper	28.00

Steel deoxidizing aluminum, notch-bar granulated or shot

Grade 1—95-97½%	17.50-18.00
Grade 2—92-95%	16.50-17.00
Grade 3—90-92%	15.50-16.00
Grade 4—85-90%	14.50-15.00

Electroplating Supplies

Anodes

(Cents per lb, freight allowed, in 500 lb lots)

Copper	
Cast, oval, 15 in. or longer	34⅝
Electrodeposited	28⅞
Rolled, oval, straight, delivered	31.46
Ball anodes	32⅞
Brass, 80-20	
Cast. oval, 15 in. or longer	30⅝
Zinc, oval, 99.886, f.o.b. Detroit	17¼
Ball anodes	16¼
Nickel 99 pct plus	
Cast	59.00
Rolled, depolarized	60.00
Cadmium	$2.15
Silver 999 fine, rolled, 100 oz lots, per troy oz, f.o.b. Bridgeport, Conn.	79

Chemicals

(Cents per lb, f.o.b. shipping point)

Copper cyanide, 100 lb drum	45.00
Copper sulfate, 99.5 crystals, bbl.	11.10
Nickel salts, single or double, 4-100 lb bags, frt allowed	13.00
Nickel chloride, 300 lb bbl.	24.50
Silver cyanide, 100 oz lots, per oz.	59
Sodium cyanide, 96 pct domestic 200 lb drums	19.25
Zinc sulfate, crystals, 22.5 pct, bags	6.75
Zinc sulfate, 25 pct, flakes, bbl.	7.75

Scrap Metals

Brass Mill Scrap

(Cents per pound; add ¼¢ per lb for shipments of 20,000 to 40,000 lb; add 1¢ for more than 40,000 lb)

	Heavy	Turnings
Copper	14⅝	13⅞
Yellow brass	12	11
Red brass	13¼	12½
Commercial bronze	13½	12¾
Manganese bronze	11⅝	10⅞
Leaded brass rod ends	11¾	....

Custom Smelters' Scrap

(Cents per pound, carload lots, delivered to refinery)

No. 1 copper wire	14.00
No. 2 copper wire	13.00
Light copper	12.00
Refinery brass	12.00*
Radiators	9.00

*Dry copper content.

Ingot Makers' Scrap

(Cents per pound, carload lots, delivered to producer)

No. 1 copper wire	14.00
No. 2 copper wire	13.00
Light copper	12.00
No. 1 composition	10.50
No. 1 comp. turnings	10.00
Rolled brass	9.25
Brass pipe	10.00
Radiators	8.75- 9.00
Heavy yellow brass	8.00- 8.25
Aluminum	
Mixed old cast	10.50-11.00
Mixed old clips	10.50-11.00
Mixed turnings, dry	8.00
Pots and pans	10.50-11.00
Low copper	11.50

Dealers' Scrap

(Dealers' buying prices, f.o.b. New York in cents per pound)

Copper and Brass

No. 1 heavy copper and wire	12¼—12½
No. 2 heavy copper and wire	11¼—11½
Light copper	10¼—10½
Auto radiators (unsweated)	7½— 7¾
No. 1 composition	8¾— 9
No. 1 composition turnings	8¼— 8½
Clean red car boxes	7½— 7¾
Cocks and faucets	7½— 7¾
Mixed heavy yellow brass	6¼— 6½
Old rolled brass	7¾— 8
Brass pipe	8¼— 8½
New soft brass clippings	10 —10½
Brass rod ends	7¾— 8
No. 1 brass rod turnings	7½— 7¾

Aluminum

Alum. pistons and struts	5 — 5½
Aluminum crankcases	7 — 8
2S aluminum clippings	10½—11
Old sheet and utensils	7 — 8
Borings and turnings	4
Misc. cast aluminum	7 — 8
Dural clips (24S)	7 — 8

Zinc

New zinc clippings	6 — 6½
Old zinc	4 — 4½
Zinc routings	2¾— 3¼
Old die cast scrap	3 — 3¼

Nickel and Monel

Pure nickel clippings	16 —17
Clean nickel turnings	14 —15
Nickel anodes	16 —17
Nickel rod ends	16 —17
New Monel clippings	10½—11½
Clean Monel turnings	6 — 7
Old sheet Monel	8 — 9
Old Monel castings	7 — 8
Inconel clippings	10 —11
Nickel silver clippings, mixed	6 — 7
Nickel silver turnings, mixed	5½— 6

Lead

Soft scrap, lead	10½—11
Battery plates (dry)	5 — 5½

Magnesium

Segregated solids	9 —10
Castings	5½— 6½

Miscellaneous

Block tin	70 —72
No. 1 pewter	43 —45
No. 1 auto babbitt	38 —40
Mixed common babbitt	11½—12
Solder joints	10½—11
Siphon tops	45 —47
Small foundry type	12¾—13¼
Monotype	12 —12½
Lino. and stereotype	11½—12
Electrotype	10½—11
New type shell cuttings	10¼—10¾
Hand picked type shells	4
Lino. and stereo. dross	5½— 5¾
Electro. dross	4¼— 4½

MARKETS—PRICES—TRENDS

SCRAP
Iron & Steel

Market Remains Firm Despite Steel Strike

Generally the market did not show any signs of reaction which would indicate that a steel strike is in progress. Prices were firm in most major market areas and the industrial lists were still bringing higher prices than the going market quotations. Some mills had been buying large tonnages till just before the strike deadline. With the temporary curtailment of mill buying, the upward rise of prices can be expected to be halted. Foundry grades remained unchanged and there is a feeling that if the steel grades should weaken the cast grades would follow this general trend. In Chicago the price of No. 1 steel was off when shipments were stopped and dealers dropped their buying prices $3.00 a ton. This resulted in a drop of $1.00 per gross ton in THE IRON AGE scrap composite to $26.92.

PITTSBURGH—The scrap market continued virtually unchanged this week, with No. 1 heavy melting holding at a nominal top of $30.00. On the basis of some activity last week, No. 2 bundles jumped 50¢ to $23.50, top, and machine shop turnings were up 50¢ to a top of $20.00.

CHICAGO—Real strength was taken out of the market when shipments were stopped, the mills went down and dealers dropped their buying prices $3.00 to $4.00. The last prices of $28.00 and $29.00 delivered for No. 1 heavy melting and factory bundles are no longer any good. The market is now predicated on what scrap can be shipped to unstruck mills and foundries and what dealers will pay. The cast prices softened a little but may strengthen again if the strike lasts very long.

PHILADELPHIA — There was no new buying of steel grades here, as mills began to close down their operations for the strike. Three major district mills were still operating early this week, and it is expected that they may continue to operate during the strike. Others sent out hold orders to their suppliers. Prices for steel grades quoted in last week's market are still firm and unchanged. Quotations reflected a purchase by a district mill from outside the district. Early this week, No. 1 and No. 1 bundles moved at quoted prices from this district to a Pittsburgh mill. Cast grades were weaker and mixed yard moved at $35.00, a reduction of $3.00.

DETROIT—With the steel strike in full swing and all mill buying temporarily curtailed, the upward rise in scrap prices persisting here for the past several weeks has been checked. A noticeable development here is a lack of storage space for scrap that might forestall mill buying even if prices proved to be attractive. The undertone of the market continues strong even though the volume of available scrap in Detroit at the moment has been estimated to be close to half a million tons, including mill supplies, scrap on local docks and in dealers' hands.

NEW YORK—Market activity here had been very slow just before the steel strike. One mill had already held up rail shipments before the strike deadline. Scrap is still needed from this area since all the mills are not struck. The higher prices over the past several weeks has resulted in better movement of material into the yards. Foundries are trying for lower prices and holding up on shipments, awaiting the final outcome of the strike.

CLEVELAND—All grades were strong here in a market that reacted more to the prices the industrial lists brought than the steel strike. Reliable sources reported that a tonnage of No. 1 bundles, sold locally, brought $30.00 to $31.00. This and other prices squelched any tendency on the part of the dealers to get panicky. On the other hand, some mills were holding up shipment after 11 p.m. Sept. 30. Others issued hold-up orders earlier in the week.

BOSTON—Though there is a little business, the attitude appears cautious, especially with the labor situation as it is. No. 1 steel shows no change at $17.00 to $18.00, but some of the other categories have moved up sharply. Chemical borings, for instance, has climbed from around $14.00 - $15.00 to $15.00 - $16.00. Shoveling turnings took a leap from around $9.00 to $14.50. Machine shop turnings, mixed borings and turnings and stove plate have shown marked advances.

BUFFALO—Strength continued to dominate the scrap market in the week immediately preceding the steel strike as an additional 10,000 tons of steelmaking items changed hands within the recently advanced ranges. New business was made up principally of No. 2 heavy melting steel and related items within the range of $25.50 to $26.00. Pre-strike firmness was also in evidence in the No. 1 heavy melting market where dealers were refusing bids within the range of $28.00-$28.50, holding out for $30.00.

CINCINNATI — Foundry grades and turnings are moving here in an otherwise inactive market. Local foundries are buying and some tonnage is moving out of the district. Blast furnace grades are gaining strength steadily as the coal strike wears on. Openhearth grades are strong, and apparently unaffected by the steel strike, which as a scrap market factor, is running a poor second to the industrial lists at the moment. The prices the lists brought also firmed up any tendency on the part of dealers to unload their tonnage, with only one major consumer in this district holding up shipment at press time.

BIRMINGHAM — With the steel strike in progress, purchases of openhearth grades halted here at the beginning of the week. Pipe shop and foundries, however, were still in the market and prices were unchanged throughout the scrap list. Receipts at dealers' yards have yet to show a pickup.

ST. LOUIS—The consumers in the St. Louis industrial district were not ready to buy scrap, and it continues, as it has been for several weeks, strictly a brokers' market. There was no change in prices. Steel mills in this district plan to continue operations, because of which they are said to be fearful that the shift of scrap offerings will change quickly this way, with the big operators down, and thus cause a weakening of the market.

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Scrap IRON & STEEL Prices

Going prices as obtained in the trade by THE IRON AGE, based on representative tonnages. All prices are per gross ton delivered to consumer unless otherwise noted.

Pittsburgh

No. 1 hvy. melting	$29.50 to $30.00
No. 2 hvy. melting	27.50 to 28.00
No. 1 bundles	29.50 to 30.00
No. 2 bundles	23.00 to 23.50
Machine shop turn.	19.50 to 20.00
Mixed bor. and ms. turn.	19.50 to 20.00
Shoveling turnings	21.00 to 22.00
Cast iron borings	20.00 to 21.00
Low phos. plate	31.50 to 32.00
Heavy turnings	24.00 to 25.00
No. 1 RR. hvy. melting	31.50 to 32.00
Scrap rails, random lgth.	34.00 to 35.00
Rails 2 ft and under	38.00 to 39.00
RR. steel wheels	33.00 to 34.00
RR. spring steel	33.00 to 34.00
RR. couplers and knuckles	33.00 to 34.00
No. 1 machinery cast.	39.00 to 40.00
Mixed yard cast.	35.50 to 36.50
Heavy breakable cast.	29.00 to 30.00
Malleable	32.00 to 33.00

Chicago

No. 1 hvy. melting	$25.00 to $26.00
No. 2 hvy. melting	23.00 to 24.00
No. 1 factory bundles	25.00 to 26.00
No. 1 dealers' bundles	21.00 to 22.00
No. 2 dealers' bundles	19.00 to 20.00
Machine shop turn.	17.00 to 18.00
Mixed bor. and turn.	16.00 to 17.00
Shoveling turnings	18.00 to 19.00
Cast iron borings	17.00 to 18.00
Low phos. forge crops	33.00 to 34.00
Low phos. plate	30.00 to 31.00
No. 1 RR. hvy. melting	29.00 to 30.00
Scrap rails, random lgth.	35.50 to 36.50
Rerolling rails	41.00 to 42.00
Rails 2 ft and under	40.00 to 41.00
Locomotive tires, cut	37.00 to 38.00
Cut boisters & side frames	35.00 to 36.00
Angles and splice bars	35.00 to 36.00
RR. steel car axles	43.00 to 44.00
No. 3 steel wheels	31.00 to 32.00
RR. couples and knuckles	35.00 to 36.00
No. 1 machinery cast.	40.00 to 41.00
No. 1 agricul. cast.	39.00 to 40.00
Heavy breakable cast.	31.00 to 32.00
RR. grate bars	30.00 to 31.00
Cast iron brake shoes	30.00 to 31.00
Cast iron car wheels	31.00 to 32.00
Malleable	36.00 to 37.00

Philadelphia

No. 1 hvy. melting	$25.00 to $26.00
No. 2 hvy. melting	24.00 to 25.00
No. 1 bundles	25.00 to 26.00
No. 2 bundles	23.00 to 24.00
Machine shop turn.	16.50 to 17.50
Mixed bor. and turn.	16.00 to 17.00
Shoveling turnings	17.00 to 18.00
Low phos. punchings, plate	27.00 to 27.50
Low phos. 5 ft and under	26.00 to 27.00
Low phos. bundles	25.50 to 26.00
Hvy. axle forge turn.	25.00 to 26.00
Clean cast chem. borings	23.00 to 24.00
R.R. steel wheels	27.00 to 29.00
RR. spring steel	27.00 to 29.00
No. 1 machinery cast	38.00 to 40.00
Mixed yard cast	34.00 to 35.00
Heavy breakable cast	34.00 to 35.00
Cast iron carwheels	36.00 to 37.00
Malleable	36.00 to 37.00

Cleveland

No. 1 hvy. melting	$26.50 to $27.00
No. 2 hvy. melting	24.00 to 24.50
No. 1 bushelings	26.50 to 27.00
No. 1 bundles	26.50 to 27.00
No. 2 bundles	19.50 to 20.00
Machine shop turn.	16.00 to 16.50
Mixed bor. and turn.	17.50 to 18.00
Shoveling turnings	17.50 to 18.00
Cast iron borings	17.50 to 18.00
Low phos. 2 ft and under	28.00 to 28.50
Steel axle turn.	26.50 to 27.00
Drop forge flashings	26.50 to 27.00
No. 1 RR. hvy. melting	32.00 to 33.00
Rails 3 ft and under	39.00 to 40.00
Rails 18 in. and under	40.00 to 41.00
No. 1 machinery cast.	41.00 to 42.00
RR. cast.	41.00 to 42.00
RR. grate bars	32.00 to 33.00
Stove plate	35.00 to 36.00
Malleable	36.00 to 37.00

Youngstown

No. 1 hvy. melting	$30.50 to $31.00
No. 2 hvy. melting	28.00 to 28.50
No. 1 bundles	30.50 to 31.00
No. 2 bundles	$22.00 to $22.50
Machine shop turn.	16.50 to 17.00
Shoveling turnings	19.50 to 20.00
Cast iron borings	19.50 to 20.00
Low phos. plate	31.50 to 32.00

Buffalo

No. 1 hvy. melting	$28.00 to $28.50
No. 2 hvy. melting	25.50 to 26.00
No. 1 busheling	25.50 to 26.00
No. 1 bundles	27.00 to 27.50
No. 2 bundles	24.00 to 24.50
Machine shop turn.	19.50 to 20.00
Mixed bor. and turn.	19.50 to 20.00
Shoveling turnings	21.50 to 22.00
Cast iron borings	19.50 to 20.00
Low phos. plate	28.50 to 29.00
Scrap rails, random lgth.	31.50 to 32.00
Rails 2 ft and under	36.50 to 37.00
RR. steel wheels	32.00 to 33.00
RR. spring steel	32.00 to 33.00
RR. couplers and knuckles	32.00 to 33.00
No. 1 cupola cast	38.00 to 39.00
Mixed yard cast.	36.50 to 37.00
Stove plate	36.50 to 37.00
Small indus. malleable	24.00 to 25.00

Birmingham

No. 1 hvy. melting	$25.00
No. 2 hvy. melting	24.00
No. 2 bundles	22.00
No. 1 busheling	24.00
Machine shop turn.	$16.00 to 17.00
Shoveling turnings	19.00
Cast iron borings	18.00
Bar crops and plate	29.00 to 30.00
Structural and plate	29.00 to 30.00
No. 1 RR. hvy. melt.	28.00 to 28.50
Scrap rails, random lgth.	29.00 to 30.00
Rerolling rails	33.00 to 34.00
Rails 2 ft and under	34.00 to 35.00
Angles & splice bars	32.00 to 33.00
Std. steel axles	28.00 to 29.00
No. 1 cupola cast	33.50 to 34.00
Stove plate	28.00
Cast iron carwheels	23.00 to 24.00

St. Louis

No. 1 hvy. melting	$27.00 to $28.00
No. 2 hvy. melting	24.00 to 25.00
No. 2 bundled sheets	24.00 to 25.00
Machine shop turn.	18.00 to 19.00
Shoveling turnings	18.00 to 19.00
Rails, random lengths	31.00 to 32.00
Rails 3 ft and under	33.00 to 34.00
Locomotive tires, uncut	27.00 to 28.00
Angles and splice bars	33.00 to 34.00
Std. steel car axles	34.00 to 36.00
RR. spring steel	29.00 to 30.00
No. 1 machinery cast	36.00 to 38.00
Hvy. breakable cast.	31.00 to 32.00
Cast iron brake shoes	31.00 to 32.00
Stove plate	33.00 to 35.00
Cast iron car wheels	34.00 to 35.00
Malleable	30.00 to 32.00

New York

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$18.50 to $19.00
No. 2 hvy. melting	17.00 to 18.00
No. 2 bundles	15.00 to 16.00
Machine shop turn.	10.00 to 11.00
Mixed bor. and turn.	10.00 to 11.00
Shoveling turnings	11.00 to 12.00
Clean cast chem. bor.	20.00 to 21.00
No. 1 machinery cast.	30.00 to 32.00
Mixed yard cast.	30.00 to 32.00
Charging box cast.	24.00 to 26.00
Heavy breakable cast.	24.00 to 26.00
Unstrp. motor blocks	25.00 to 26.00

Boston

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$17.00 to 18.00
No. 2 hvy. melting	15.00 to 16.00
No. 1 bundles	17.00 to 18.00
No. 2 bundles	$15.00 to $16.00
Machine shop turn.	12.50 to 13.00
Mixed bor. and turn.	10.00 to 10.50
Shoveling turnings	14.00 to 14.50
No. 2 busheling	14.00 to 14.50
Clean cast chem. borings	15.00 to 16.00
No. 1 machinery cast.	31.00 to 33.00
No. 2 machinery cast.	27.00 to 28.00
Heavy breakable cast.	20.00 to 21.00
Stove plate	24.00 to 25.00

Detroit

Brokers' buying prices per gross ton, on cars:

No. 1 hvy. melting	$20.00 to $21.00
No. 2 hvy. melting	17.00 to 18.00
No. 1 bundles	22.00 to 23.00
New busheling	20.00 to 21.00
Flashings	20.00 to 21.00
Machine shop turn.	14.00 to 15.00
Mixed bor. and turn.	14.00 to 15.00
Shoveling turnings	16.00 to 17.00
Cast iron borings	16.00 to 17.00
Low phos. plate	20.00 to 21.00
No. 1 cupola cast	33.00 to 34.00
Heavy breakable cast	27.00 to 29.00
Stove plate	26.00 to 27.00
Automotive cast	33.00 to 34.00

Cincinnati

Per gross ton, f.o.b. cars:

No. 1 hvy. melting	$25.50 to $26.00
No. 2 hvy. melting	21.50 to 22.00
No. 1 bundles	25.50 to 26.00
No. 2 bundles	19.50 to 20.00
Machine shop turn.	12.50 to 13.00
Mixed bor. and turn.	12.50 to 13.00
Shovelings turnings	15.50 to 16.00
Cast iron borings	14.50 to 15.00
Low phos. 18 in. under	34.00 to 35.00
Rails, random lengths	34.00 to 35.00
Rails, 18 in. and under	44.00 to 45.00
No. 1 cupola cast	40.00 to 41.00
Hvy. breakable cast	34.00 to 35.00
Drop broken cast	43.00 to 44.00

San Francisco

No. 1 hvy. melting	$20.00
No. 2 hvy. melting	18.00
No. 1 bundles	16.00
No. 2 bundles	16.00
No. 3 bundles	13.00
Machine shop turn	9.00
Elec. fur 1 ft and under	28.00
No. 1 RR. hvy. melting	17.00
Scrap rails, random lgth.	17.00
No. 1 cupola cast.	30.00

Los Angeles

No. 1 hvy. melting	$20.00
No. 2 hvy. melting	18.00
No. 1 bundles	16.00
No. 2 bundles	16.00
No. 3 bundles	13.00
Mach. shop turn.	12.00
Elec. fur. 1 ft and under	30.00
No. 1 RR. hvy. melting	20.00
No. 1 cupola cast.	$36.00 to 40.00

Seattle

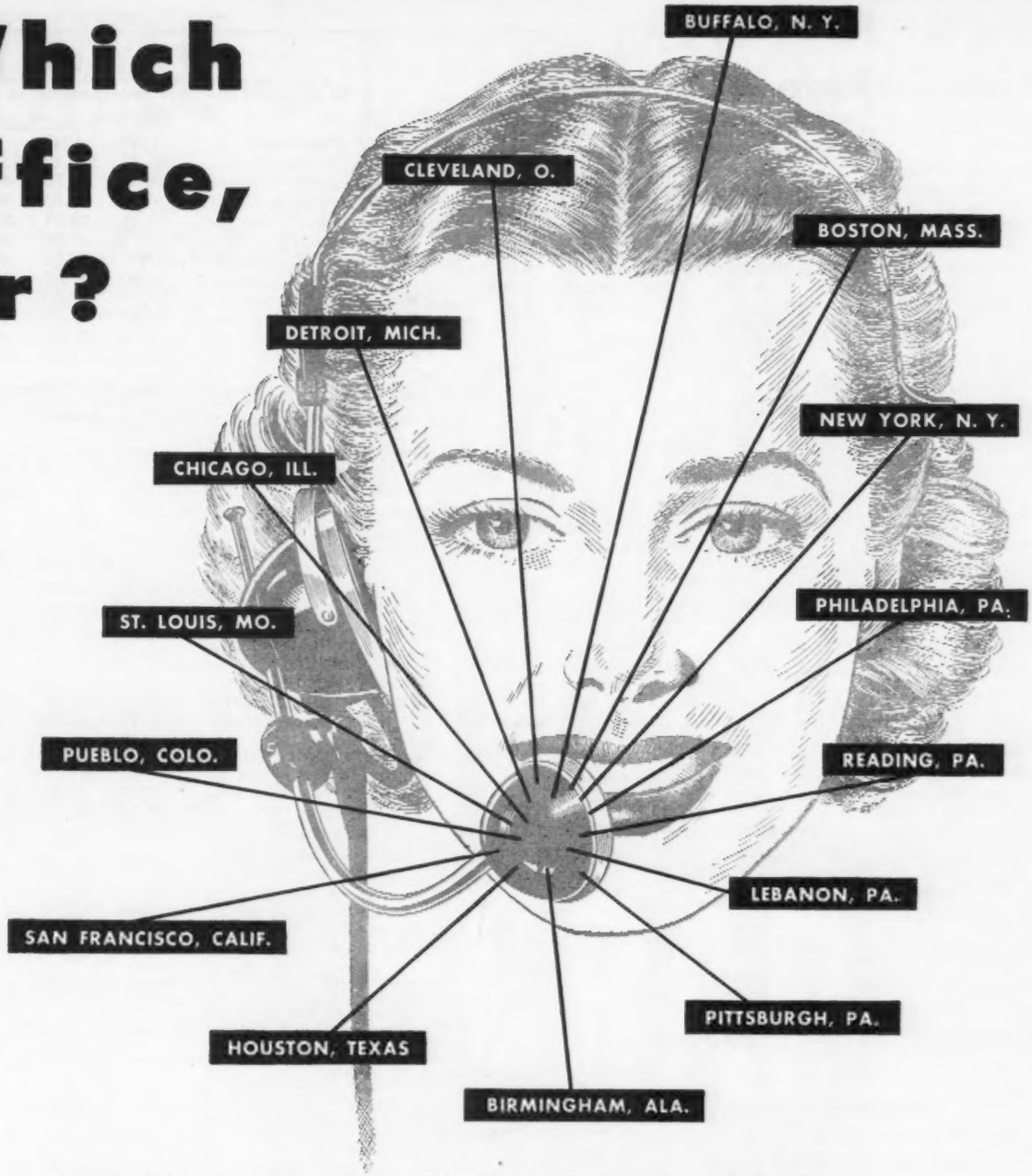
No. 1 hvy. melting	$16.00
No. 2 hvy. melting	16.00
No. 1 bundles	15.00
No. 2 bundles	15.00
No. 3 bundles	12.00
Elec. fur. 1 ft and under	21.00
RR. hvy. melting	19.00
No. 1 cupola cast	$20.00 to 27.00
Heavy breakable cast	20.00

Hamilton, Ont.

Cast grades f.o.b. shipping point:

No. 1 hvy. melting	$20.00
No. 1 bundles	20.00
No. 2 bundles	19.50
Mechanical bundles	18.00
Mixed steel scrap	16.00
Mixed bor. and turn.	14.00
Rails, remelting	20.00
Rails, rerolling	23.00
Bushelings	14.50
Bush., new fact, prep'd.	18.00
Bush., new fact, unprep'd.	13.00
Short steel turnings	14.00
Cast scrap	$33.00 to 35.00

Which office, sir?



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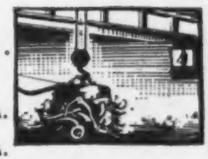

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LEADERS IN IRON AND STEEL SCRAP SINCE 1889

Comparison of Prices

Steel prices on this page are the average of various f.o.b. quotations of major producing areas: Pittsburgh, Chicago, Gary, Cleveland, Youngstown.

Flat-Rolled Steel: (cents per pound)	Oct. 4, 1949	Sept. 27, 1949	Sept. 6, 1949	Oct. 5, 1948
Hot-rolled sheets	3.25	3.25	3.25	3.26
Cold-rolled sheets	4.00	4.00	4.00	4.00
Galvanized sheets (10 ga)	4.40	4.40	4.40	4.40
Hot-rolled strip	3.25	3.25	3.25	3.265
Cold-rolled strip	4.038	4.038	4.038	4.063
Plates	3.40	3.40	3.40	3.42
Plates wrought iron	7.85	7.85	7.85	7.85
Stains C-R strip (No. 302)	33.00	33.00	33.00	33.00
Tin and Terneplate: (dollars per base box)				
Tinplate (1.50 lb) cokes	$7.75	$7.75	$7.75	$6.80
Tinplate, electro (0.50 lb)	6.70	6.70	6.70	6.00
Special coated mfg. ternes	6.65	6.65	6.65	5.90
Bars and Shapes: (cents per pound)				
Merchant bars	3.35	3.35	3.35	3.37
Cold-finished bars	3.995	3.995	3.995	3.995
Alloy bars	3.75	3.75	3.75	3.75
Structural shapes	3.25	3.25	3.25	3.25
Stainless bars (No. 302)	28.50	28.50	28.50	28.50
Wrought iron bars	9.50	9.50	9.50	9.50
Wire: (cents per pound)				
Bright wire	4.15	4.15	4.15	4.256
Rails: (dollars per 100 lb)				
Heavy rails	$3.20	$3.20	$3.20	$3.20
Light rails	3.55	3.55	3.55	3.55
Semifinished Steel: (dollars per net ton)				
Rerolling billets	$52.00	$52.00	$52.00	$52.00
Slabs, rerolling	52.00	52.00	52.00	52.00
Forging billets	61.00	61.00	61.00	61.00
Alloy blooms, billets, slabs	63.00	63.00	63.00	63.00
Wire rod and Skelp: (cents per pound)				
Wire rods	3.40	3.40	3.40	3.619
Skelp	3.25	3.25	3.25	3.25

Price advances over previous week are printed in Heavy Type; declines appear in *Italics*.

Pig Iron: (per gross ton)	Oct. 4, 1949	Sept. 27, 1949	Sept. 6, 1949	Oct. 5, 1948
No. 2, foundry, Phila.	$50.42	$50.42	$50.42	$51.56
No. 2, Valley furnace	46.50	46.50	46.50	45.00
No. 2, Southern Cin'ti	46.08	46.08	46.08	49.47
No. 2, Birmingham	39.38	39.38	39.38	43.38
No. 2, foundry, Chicago†	46.50	46.50	46.50	46.50
Basic del'd Philadelphia	49.92	49.92	49.92	50.76
Basic, Valley furnace	46.00	46.00	46.00	44.50
Malleable, Chicago†	46.50	46.50	46.50	46.50
Malleable, Valley	46.50	46.50	46.50	45.00
Charcoal, Chicago	68.56	68.56	68.56	73.78
Ferromanganese‡	173.40	173.40	173.40	161.71

†The switching charge for delivery to foundries in the Chicago district is $1 per ton.
‡Average of U. S. prices quoted on Ferroalloy page.

Scrap: (per gross ton)				
Heavy melt'g steel, P'gh.	$29.75	$29.75	$24.75	$42.75
Heavy melt'g steel, Phila.	25.50	25.50	22.50	45.00
Heavy melt'g steel, Ch'go	*25.50*	28.50	24.50	41.75
No. 1 hy. comp. sh't Det.	*22.50*	23.50	23.50	38.00
Low phos. Young'n	31.75	31.75	29.75	47.75
No. 1, cast, Pittsburgh	39.50	39.50	36.50	70.00
No. 1, cast, Philadelphia	39.00	39.00	33.50	65.50
No. 1, cast, Chicago	*40.50*	42.50	41.50	69.50
Coke: Connellsville: (per net ton at oven)				
Furnace coke, prompt	$14.25	$14.25	$14.25	$15.00
Foundry coke, prompt	15.75	15.75	15.75	17.00
Nonferrous Metals: (cents per pound to large buyers)				
Copper, electro, Conn.	17.625	17.625	17.625	23.50
Copper, Lake Conn.	17.75	17.75	17.75	23.625
Tin, Straits, New York	**96.00**	95.00	$1.03	$1.03
Zinc, East St. Louis	*9.25*	10.00	10.25	15.00
Lead, St. Louis	*14.05*	14.60	14.925	19.30
Aluminum, virgin	17.00	17.00	17.00	16.00
Nickel electrolytic	42.93	42.93	42.93	42.90
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	38.50	38.50	38.50	35.00

Composite Prices

Starting with the issue of May 12, 1949, the weighted finished steel composite was revised for the years 1941 to date. The weights used are based on the average product shipments for the 7 years 1937 to 1940 inclusive and 1946 to 1948 inclusive. The use of quarterly figures has been eliminated because it was too sensitive. (See p. 139 of May 12, 1949, issue.)

	Finished Steel Base Price	Pig Iron	Scrap Steel
Oct. 4, 1949	3.705¢ per lb.	$45.88 per gross ton	*$26.92* per gross ton
One week ago	3.705¢ per lb.	45.88 per gross ton	27.92 per gross ton
One month ago	3.705¢ per lb.	45.88 per gross ton	23.92 per gross ton
One year ago	3.720¢ per lb.	46.16 per gross ton	43.16 per gross ton

	Finished Steel High	Finished Steel Low	Pig Iron High	Pig Iron Low	Scrap Steel High	Scrap Steel Low
1949	3.720¢ Jan. 1	3.705¢ May 3	$46.82 Jan. 4	$45.88 Sept. 6	$43.00 Jan. 1	$19.33 June 28
1948	3.721¢ July 27	3.193¢ Jan. 1	46.91 Oct. 12	39.58 Jan. 6	43.16 July 27	39.75 Mar. 9
1947	3.193¢ July 29	2.848¢ Jan. 1	37.98 Dec. 30	30.14 Jan. 7	42.58 Oct. 28	29.50 May 20
1946	2.848¢ Dec. 31	2.464¢ Jan. 1	30.14 Dec. 10	25.37 Jan. 1	31.17 Dec. 24	19.17 Jan. 1
1945	2.464¢ May 29	2.396¢ Jan. 1	25.37 Oct. 23	23.61 Jan. 2	19.17 Jan. 2	18.92 May 22
1944	2.396¢	2.396¢	$23.61	$23.61	19.17 Jan. 11	15.76 Oct. 24
1943	2.396¢	2.396¢	23.61	23.61	$19.17	$19.17
1942	2.396¢	2.396¢	23.61	23.61	19.17	19.17
1941	2.396¢	2.396¢	$23.61 Mar. 20	$23.45 Jan. 2	$22.00 Jan. 7	$19.17 Apr. 10
1940	2.30467¢ Jan. 2	2.24107¢ Apr. 16	23.45 Dec. 23	22.61 Jan. 2	21.83 Dec. 30	16.04 Apr. 9
1939	2.35367¢ Jan. 3	2.26689¢ May 16	22.61 Sept. 19	20.61 Sept. 12	22.50 Oct. 3	14.08 May 16
1938	2.58414¢ Jan. 4	2.27207¢ Oct. 18	23.25 June 21	19.61 July 6	15.00 Nov. 22	11.00 June 7
1937	2.58414¢ Mar. 9	2.32263¢ Jan. 4	23.25 Mar. 9	20.25 Feb. 16	21.92 Mar. 30	12.67 June 9
1936	2.32263¢ Dec. 28	2.05200¢ Mar. 10	19.74 Nov. 24	18.73 Aug. 11	17.75 Dec. 21	12.67 June 8
1935	2.07642¢ Oct. 1	2.06492¢ Jan. 8	18.84 Nov. 5	17.83 May 14	13.42 Dec. 10	10.33 Apr. 29
1934	2.15367¢ Apr. 24	1.95757¢ Jan. 2	17.90 May 1	16.90 Jan. 27	13.00 Mar. 13	9.50 Sept. 25
1933	1.95578¢ Oct. 3	1.75836¢ May 2	16.90 Dec. 5	13.56 Jan. 3	12.25 Aug. 8	6.75 Jan. 3
1932	1.89196¢ July 5	1.83901¢ Mar. 1	14.81 Jan. 5	13.56 Dec. 6	8.50 Jan. 12	6.43 July 5
1931	1.99626¢ Jan. 13	1.86586¢ Dec. 29	15.90 Jan. 6	14.79 Dec. 15	11.33 Jan. 6	8.50 Dec. 29
1929	2.31773¢ May 28	2.26498¢ Oct. 29	18.71 May 14	18.21 Dec. 17	17.58 Jan. 29	14.08 Dec. 8

Weighted index based on steel bars, shapes, plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing major portion of finished steel shipments. Index recapitulated in Aug. 28, 1941, issue and in May 12, 1949.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

Average of No. 1 heavy melting steel scrap delivered to consumers at Pittsburgh, Philadelphia and Chicago.

KEYWELL . . . DEPENDABLE SERVICE

for Over 30 YEARS

STAINLESS STEEL
•
ELECTRIC FURNACE
•
BLAST FURNACE
•
CAST IRON
•
OPEN HEARTH

MILL SUPPLIERS OF IRON & STEEL SCRAP

Samuel G. Keywell Herbert W. Smith Barney L. Keywell

THE SAMUEL G. KEYWELL CO. INC.

2900 ST. JEAN, DETROIT 14, MICH., VALLEY 2-8800

PITTSBURGH OFFICES: 3111 JENKINS ARCADE BLDG., PITTSBURGH 22, PA.

E. CLYDE GRIMM, VICE-PRESIDENT — TELEPHONE: GRANT 8030

STEEL PRICES

Smaller numbers indicate producing companies. See key on facing page.

Base prices at producing points apply to the sizes and grades produced in these areas. Prices are in cents per lb unless otherwise noted. Extras apply.

	Pittsburgh Weirton	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown	Warren	Detroit	Johnstown	Seattle, S. Frisco, Los Angeles	Fontana
INGOTS Carbon forging	$50.00 1											$50.00 31			
Alloy	$51.00 1.17											$51.00 31			
BILLETS, BLOOMS, SLABS Carbon, rerolling, net ton	$52.00 1	$52.00 1	$52.00 1		$52.00 11	$52.00 3	Conshohocken $57.00[26]						$52.00 3		$71.00 19
Carbon forging billets, net ton	$61.00 1	$61.00 1.4	$61.00 1.8	$61.00 4	$61.00 11	$61.00 3.4	Geneva $61.00[16] Conshohocken $63.00[26]				$61.00 25	$61.00 31	$61.00 3		$80.00 19
Alloy, net ton	$63.00 1.17	$63.00 1.4	$63.00 1			$63.00 3.4	Bethlehem,[3] Canton,[4,42] Massillon[4] = $63.00			Conshohocken $65.00[26]		$63.00 31	$63.00 3		$82.00 19
PIPE SKELP	3.25 1.5						3.25 1.4				3.25				
WIRE RODS	3.40 2.18	3.40 2.4.22	3.40	3.40 2	3.40 4.11		3.40 6	3.50 3	Portsmouth 3.40[20]		Worcester 3.70[2]		3.40	4.05[24] S.F., L.A. 4.20[23] L.A.	
SHEETS Hot-rolled (18 ga. & hvr.)	3.25 1.5.9.15	3.25 22	3.25 1.6.8	3.25 4.5	3.25 4.11	3.25 3	3.25 1.6.13	3.25 3	Kokomo,[30] Ashland[7] = 3.25		3.25 4	3.45 12	Consh. 3.35[26]	3.95 24 L.A.	4.15 19
Cold-rolled	4.00[1.5] 7.9.15.62		4.00 1.6.8	4.00 4.5	4.00 11	4.00 3	4.00 6	4.00 3	4.20	4.00 7	4.00 4	4.20 12		4.95 24 S.F.	4.90 19
Galvanized (10 gage)	4.40 1.9.15		4.40 1.8		4.40 4.11		Niles 4.40[64]	4.40 3	Canton 4.40[4]	4.40 7	Ashland 4.40[7]			5.15 24 S.F., L.A.	
Enameling (12 gage)	4.40 1		4.40 1.8	4.40 4			4.40 6		4.60 22	4.40 7		4.70 12			
Long ternes (10 gage)	4.80 1.15		4.80 1							4.80 7					
Hi Str. Low Alloy, h.r.	4.95 1.5.9	4.95 1	4.95 1.6.8	4.95 4.5	4.95 11	4.95 3	4.95 1.6	4.95 3	Conshohocken 4.95[26]		4.95 4	5.15 12			
Hi Str. Low Alloy, c.r.	6.05 1.5		6.05 1.6.8	6.05 4.5		6.05 3	6.05 6	6.05 3			6.05 4	6.25 12			
Hi Str Low Alloy, galv.	6.75 1			6.75 4				6.75 3	Canton 6.75[4]						
STRIP Hot-rolled	3.25 5.7.9.28	3.25 23.66	3.25 1.6.8	3.25 5	3.25 11	3.25 3	3.25 1.6.13	3.25 3	Ashland 3.25[7]	3.25 7	3.25 4	3.45 12.47	Atlanta 3.40[65]	4.00,[62] S.F., L.A. 4.25[62] S	4.40 19
Cold-rolled	4.00 5.7.9.62	4.15 66	4.00 8	4.00 2.5		4.00 3	4.00 6.13. 40.48	4.00 3	New Haven 4.60[2.48]		4.00[4,49] 4.25[49]	4.20 12.47 4.25[1365]			4.90 19
Hi Str. Low Alloy, h.r.	4.95 5		4.95 1.6.8	4.95 5	4.95 11	4.95 3	4.95 1.6.13	4.95 3			4.95 4	5.15 12			
Hi Str. Low Alloy, c.r.	6.05 5.9			6.05 2.5		6.05 3	6.05 6.13	6.05 3			6.05 4	6.25 12		4.00[24,62] S.F., L.A. 4.25[62] S.	6.95 19
TINPLATE† Cokes, 1.50 lb. base box	$7.75 1.5.9.15		$7.75 1.6.8		$7.85 11			$7.85 3	$7.95 22		7.75 4			8.50 24 S.F.	
Electrolytic 0.25, 0.50, 0.75 lb. box	Deduct $1.30, $1.05 and 75¢ respectively from 1.50 lb. coke base box price														
BLACKPLATE, 29 ga. Hollowware enameling	5.30 1.5.15		5.30 1.6.8					5.40 8	5.50 22		5.30 4				
BARS Carbon Steel	3.35 1.5.9.17	3.35 1.4.22	3.35 1.6.8	3.35 4	3.35 4.11	3.35 3.4	3.35 1.4.6	3.35 3	Atlanta 3.50[65]	Canton 3.35[4]		3.55 12	3.35 3	4.05[62] L.A. 4.05[24] S.F., L.A.	4.00 19
Reinforcing††	3.35 1.5	3.35 4	3.35 1.6.8	3.35 4	3.35 4.11	3.35 3.4	3.35 1.4.6	3.35 3	Atlanta 3.50[65]	Canton 3.35[4]			3.35 3	4.10[62] S., S.F.	4.00 19
Cold-finished	3.95[5] 4.00[2,4] 17.52.69.71	4.00 2.22.69. 70	4.00 4.73.74	4.00 2.61		4.00 70	4.00 6.67 40		Putnam, Newark = 4.40[69] Cumberland = 3.95[72] Massillon, Canton = 4.00[4]			4.30 12			
Alloy, hot-rolled	3.75 1.17	3.75 1.4.22	3.75 1.6.8			3.75 3.4	3.75 1.6	Bethlehem,[3] Canton,[4,42] Massillon[4] = 3.75			3.75 25	4.05 12	3.75 3	4.80 62 L.A.	4.75 19
Alloy cold-drawn	4.65 2.17.52.69.71	4.65 2.22. 69.70	4.65 4.73.74	4.65 2.61		4.65 3.70	4.65 6.67		Massillon = 4.65[4] Bethlehem = 4.65[3]		4.65 25	Canton = 4.65[4,42] Newark,[69] Worcester[2] = 4.95			
Hi Str. Low Alloy, h.r.	5.10 1.5		5.10 1.6.8	5.10 4	5.10 11	5.10 3	5.10 1.6	Bethlehem = 5.10[3]				5.30 12	5.10 3		
PLATE Carbon steel	3.40 1.5	3.40 1	3.40 1.6.8	3.40 4	3.40[4,11]	3.40[31] Conshohocken = 3.50[26]	3.40[13]	3.40[3] Geneva = 3.40,[16]	Coatesville = 3.50,[21] Claymont = 3.50[29] Harrisburg = 3.50[35]			3.65 12	3.40 3	4.30 62 S.	4.00 19
Floor plates	4.55 1	4.55 1	4.55 8	4.55 5				Conshohocken,[26] Harrisburg[35] = 4.55							
Alloy	4.40 1	4.40 1	4.40 1		Conshohocken = 4.40[26]			4.40 8	Coatesville = 4.50[21]				4.40 3		
Hi Str. Low Alloy	5.20 1.5	5.20 1	5.20 1.8	5.10 4.5	5.20 11		5.20 6	5.20 3	Conshohocken = 5.20[26] Geneva = 5.20[16]			5.45 12	5.20 3		
SHAPES, Structural	3.25 1.5.9	3.25 1.22	3.25 1.6.8		3.25 11	3.30 3	Bethlehem = 3.30,[3] Geneva = 3.25[16] Minnequa, Colo. = 3.75[14]						3.30 3	3.80[62] S.F. 3.85[62] L.A.	3.80 19
Hi Str. Low Alloy	4.95 1.5	4.95 1	4.95 1.6.8		4.95 11	5.05 3	4.95 6		Bethlehem = 5.05[3]				5.05 3	3.90[63] S. 3.85[24] L.A.	
MANUFACTURERS' WIRE Bright	4.15 2.5.18	4.15[4,33] 2.24		4.15 2.77	4.15 4.11	Portsmouth 4.15[20]	4.15 6	4.25 3		Duluth = 4.15,[2] Worcester = 4.45[2] Pueblo = 4.50[14]			4.15 3	5.10[24] S.F. 5.10[63] L.A. 5.10[24] L.A.	
PILING, Steel sheet	4.05 1.9	4.05 1				4.05 3									

STAINLESS STEELS

Base prices, in cents per pound, f.o.b. producing point

Product	301	302	303	304	316	321	347	410	416	430
Ingots, rerolling	12.75	13.50	15.00	14.50	22.75	18.25	20.00	11.25	13.75	11.50
Slabs, billets, rerolling	17.00	18.25	20.25	19.25	30.25	24.50	26.75	15.00	18.50	15.25
Forg. discs, die blocks, rings	30.50	30.50	33.00	32.00	49.00	38.50	41.00	24.50	25.00	25.00
Billets, forging	24.25	24.25	26.25	25.50	39.00	29.00	32.75	19.50	20.00	20.00
Bars, wire, structurals	28.50	28.50	31.00	30.00	46.00	34.00	38.50	23.00	23.50	23.50
Plates	32.00	32.00	34.00	34.00	50.50	39.50	44.00	26.00	26.50-27.00	26.50
Sheets	37.50	37.50	39.50	39.50	53.00	45.50	50.00	33.00	33.50	35.50
Strip, hot-rolled	24.25	25.75	30.00	27.75	46.00	34.50	38.75	21.25	28.00	21.75
Strip, cold-rolled	30.50	33.00	36.50	35.00	55.00	44.50	48.50	27.00	33.50	27.50

Numbers correspond to producers. See Key below.

STAINLESS STEEL PRODUCING POINTS—*Sheets:* Midland, Pa., 17; Brackenridge, Pa., 28; Butler, Pa., 7; McKeesport, Pa., 1; Washington, Pa., 38, 39; Baltimore, 37; Middletown, Ohio, 7; Massillon, Ohio, 4; Gary, 1; Bridgeville, Pa., 59; New Castle, Ind., 55; Lockport, N. Y., 46.

Strip: Midland, Pa., 17; Cleveland, 2; Carnegie, Pa., 41; McKeesport, Pa., 54; Reading, Pa., 36; Washington, Pa., 38; W. Leechburg, Pa., 28; Bridgeville, Pa., 59; Detroit, 47; Massillon, Canton, Ohio, 4; Middletown, Ohio, 7; Harrison, N. J., 49; Youngstown, 48; Lockport, N. Y., 46; New Britain, Conn., 58; Sharon, 13.

Bars: Baltimore, 7; Duquesne, Pa., 1; Munhall, Pa., 1; Reading, Pa., 36; Titusville, Pa., 59; Washington, Pa., 39; McKeesport Pa., 1, 54; Bridgeville, Pa., 59; Dunkirk, N. Y., 28; Massillon, Ohio, 4; Chicago, 1, 67; Syracuse, N. Y., 17; Watervliet, N. Y., 28; Waukegan, Ill. 2; Lockport, N. Y., 46; Canton, Ohio, 42.

Wire: Waukegan, Ill., 2; Massillon, Ohio, 4; McKeesport, Pa., 54; Bridgeport, Conn., 44; Chicago, 67; Trenton, N. J., 45; Harrison, N. J., 80.

Structurals: Baltimore, 7; Massillon, Ohio, 4; Chicago, 1, 67; Watervliet, N. Y., 28; Bridgeport, Conn., 44.

Plates: Brackenridge, Pa., 28; Butler, Pa., 7; Chicago, 1; Munhall, Pa., 1; Midland, Pa., 17; New Castle, Ind., 55; Lockport, N. Y., 46; Middletown, 7; Washington, Pa., 39; Cleveland, Massillon, 4.

Forged discs, die blocks and rings: Pittsburgh, 1, 17; Syracuse, 17; Ferndale, Mich., 28.

Forging billets: Midland, Pa, 17; Baltimore, 7; Washington, Pa., 39; Mckeesport, 54; Massillon, Canton, Ohio, 4; Watervliet, 28; Pittsburgh, Chicago 1.

KEY TO STEEL PRODUCERS

With Home Offices

1 Carnegie-Illinois Steel Corp., Pittsburgh
2 American Steel & Wire Co., Cleveland
3 Bethlehem Steel Co., Bethlehem
4 Republic Steel Corp., Cleveland
5 Jones & Laughlin Steel Corp., Pittsburgh
6 Youngstown Sheet & Tube Co., Youngstown
7 Armco Steel Corp., Middletown, Ohio
8 Inland Steel Co., Chicago
9 Weirton Steel Co., Weirton, W. Va.
10 National Tube Co., Pittsburgh
11 Tennessee Coal, Iron & R.R. Co., Birmingham
12 Great Lakes Steel Corp., Detroit
13 Sharon Steel Corp., Sharon, Pa.
14 Colorado Fuel & Iron Corp., Denver
15 Wheeling Steel Corp., Wheeling, W. Va.
16 Geneva Steel Co., Salt Lake City
17 Crucible Steel Co. of America, New York
18 Pittsburgh Steel Co., Pittsburgh
19 Kaiser Co., Inc., Oakland, Calif.
20 Portsmouth Steel Corp., Portsmouth, Ohio
21 Lukens Steel Co., Coatesville, Pa.
22 Granite City Steel Co., Granite City, Ill.
23 Wisconsin Steel Co., South Chicago, Ill.
24 Columbia Steel Co., San Francisco
25 Copperweld Steel Co., Glassport, Pa.
26 Alan Wood Steel Co., Conshohocken, Pa.
27 Midvale Co., Philadelphia
28 Allegheny Ludlum Steel Corp., Pittsburgh
29 Worth Steel Co., Claymont, Del.
30 Continental Steel Corp., Kokomo, Ind.
31 Rotary Electric Steel Co., Detroit
32 Laclede Steel Co., St. Louis
33 Northwestern Steel & Wire Co., Sterling, Ill.
34 Keystone Steel & Wire Co., Peoria, Ill.
35 Central Iron & Steel Co., Harrisburg, Pa.
36 Carpenter Steel Co., Reading, Pa.
37 Eastern Stainless Steel Corp., Baltimore
38 Washington Steel Corp., Washington, Pa.
39 Jessop Steel Co., Washington, Pa.
40 Blair Strip Steel Co., New Castle, Pa.
41 Superior Steel Corp., Carnegie, Pa.
42 Timken Steel & Tube Div., Canton, Ohio
43 Babcock & Wilcox Tube Co., Beaver Falls, Pa.
44 American Chain & Cable Co., Inc., New York
45 John A. Roebling's Sons Co., Trenton, N. J.
46 Simonds Saw & Steel Co., Fitchburg, Mass.
47 McLouth Steel Corp., Detroit
48 Cold Metal Products Co., Youngstown
49 Thomas Steel Co., Warren, Ohio
50 Wilson Steel & Wire Co., Chicago
51 Sweet's Steel Co., Williamsport, Pa.
52 Superior Drawn Steel Co., Monaca, Pa.
53 A. M. Byers Co., Pittsburgh
54 Firth Sterling Steel & Carbide Corp., McKeesport, Pa.
55 Ingersoll Steel Div., Chicago
56 Latrobe Electric Steel Co., Latrobe, Pa.
57 Fitzsimons Steel Co., Youngstown
58 Stanley Works, New Britain, Conn.
59 Universal-Cyclops Steel Corp., Bridgeville, Pa.
60 Vanadium-Alloys Steel Co., Latrobe, Pa.
61 Cuyahoga Steel & Wire Co., Cleveland
62 Bethlehem Pacific Coast Steel Corp., San Francisco
63 Follansbee Steel Corp., Pittsburgh
64 Niles Rolling Mill Co., Niles, Ohio
65 Atlantic Steel Co., Atlanta
66 Acme Steel Co., Chicago
67 Joslyn Mfg. & Supply Co., Chicago
68 Detroit Steel Corp., Detroit
69 Wyckoff Steel Co., Pittsburgh
70 Bliss & Laughlin, Inc., Harvey, Ill.
71 Columbia Steel & Shafting Co., Pittsburgh
72 Cumberland Steel Co., Cumberland, Md.
73 La Salle Steel Co., Chicago
74 Monarch Steel Co., Inc., Indianapolis
75 Empire Steel Co., Mansfield, Ohio
76 Mahoning Valley Steel Co., Niles, Ohio
77 Oliver Iron & Steel Co., Pittsburgh
78 Pittsburgh Screw & Bolt Co., Pittsburgh
79 Standard Forgings Corp., Chicago
80 Driver Harris Co., Harrison, N. J.

Notes to Steel Price Table:

†Special coated mfg ternes, deduct $1.10 from 1.50-lb coke base box price. Can-making quality blackplate, 55 to 128-lb, deduct $2.00 from 1.50-lb coke base box.

‡Straight lengths only from producer to fabricator.

PIPE AND TUBING

Base discounts, f.o.b. mills
Base price, about $200.00 per net ton

Standard, Threaded and Coupled

Steel, buttweld*	Black	Galv
⅛-in.	43 to 41	26½ to 24½
¼-in.	46 to 44	30½ to 28½
1-in.	48½ to 46½	33½ to 31½
1¼-in.	49 to 47	34 to 32
1½-in.	49½ to 47½	34½ to 32½
2-in.	50 to 48	35 to 33
2½ to 3-in.	50½ to 48½	35½ to 33½

Steel, lapweld		
2-in.	39½	26 to 24
2½ to 3-in.	43½ to 42½	28 to 27
3½ to 6-in.	46½ to 42½	31 to 27

Steel, seamless		
2-in.	38½	23
2½ to 3-in.	41½	26
3½ to 6-in.	43½	28

Wrought Iron, buttweld		
⅛-in.	+20½	+47
¼-in.	+10½	+36
⅜ & 1¼ in.	+ 4½	+27
2-in.	— 1½	+23½
3-in.	— 2	+23

Wrought Iron, lapweld		
2-in.	+ 7½	+31
2½ to 3½-in.	+ 5	+26½
4-in.	list	+20½
4½ to 8-in.	+ 2	+22

Extra Strong, Plain Ends

Steel, buttweld		
⅛-in.	42 to 40	27 to 25
¼-in.	46 to 44	31 to 29
1-in.	48 to 46	34 to 32
1¼-in.	48½ to 46½	34½ to 32½
1½-in.	49 to 47	35 to 33
2-in.	49½ to 47½	35½ to 34½
2½ to 3-in.	50 to 48	36 to 34

Steel, lapweld		
2-in.	39½ to 38½	25 to 24
2½ to 3-in.	44½ to 42½	30 to 28
3½ to 6-in.	48 to 44	33½ to 31½

Steel, seamless		
2-in.	37½	23
2½ to 3-in.	41½	27
3½ to 6-in.	45	30½

Wrought Iron, buttweld		
⅛-in.	+16	+40
¼-in.	+ 9½	+34
1 to 2-in.	— 1½	+23

Wrought Iron, lapweld		
2-in.	+ 4½	+27½
2½ to 4-in.	— 5	+16
4½ to 6-in.	— 1	+20½

For threads only, buttweld, lapweld and seamless pipe, one point higher discount (lower price) applies. For plain ends, buttweld, lapweld and seamless pipe 3-in. and smaller, three points higher discount (lower price) applies, while for lapweld and seamless 3½-in. and larger four points higher discount (lower price) applies. On buttweld and lapweld steel pipe, jobbers are granted a discount of 5 pct. *Fontana, Calif., deduct 11 points from figures in left columns.

BOILER TUBES

Seamless steel and electric welded commercial boiler tubes and locomotive tubes, minimum wall. Prices per 100 ft at mill in carload lots, cut length 4 to 24 ft inclusive.

OD in.	Gage BWG	Seamless H.R.	Seamless C.R.	Electric Weld H.R.	Electric Weld C.D.
2	13	$19.18	$22.56	$18.60	$21.89
2½	12	25.79	30.33	25.02	29.41
3	12	28.68	33.76	27.82	32.74
3½	11	35.85	42.20	34.78	40.94
4	10	44.51	52.35	43.17	50.78

CAST IRON WATER PIPE

Per net ton

6 to 24-in., del'd Chicago $95.70
6 to 24-in., del'd N. Y. ..... $92.50 to 97.40
6 to 24-in., Birmingham 82.50
6-in. and larger, f.o.b. cars, San Francisco, Los Angeles, for all rail shipment; rail and water shipment less 109.30

Class "A" and gas pipe, $5 extra; 4-in. pipe is $5 a ton above 6-in.

MERCHANT WIRE PRODUCTS

To the dealer, f.o.b. mill

	Base Column	Pittsburg, Calif.
Standard & coated nails*	103	122
Woven wire fence†	109	132
Fence posts, carloads††	112	...
Single loop bale ties	106	130
Galvanized barbed wire**	123	143
Twisted barbless wire	123	...

* Pgh., Chi., Duluth; Worcester, 6 colmns higher. † 15½ gage and heavier. ** On 80 rod spools, in carloads. †† Duluth, Joliet and Johnstown.

	Base per 100 lb	Pittsburg, Calif.
Annealed fence wire‡	$4.80	$5.75
Annealed, galv. fencing‡	5.25	6.20
Cut nails, carloads‡‡	6.75	...

‡ Add 30¢ at Worcester; 10¢ at Sparrows Pt.

‡‡ Less 20¢ to jobbers.

PRODUCING POINTS — *Standard, coated or galvanized nails, woven wire fence, bale ties, and barbed wire:* Alabama City, Ala., 4; Atlanta, 65; Aliquippa, Pa. (except bale ties), 5; Bartonville, Ill. (except bale ties), 34; Chicago, 4; Donora, Pa., 2; Duluth, 2; Fairfield, Ala., 11; Johnstown, Pa. (except bale ties), 3; Joliet, Ill., 2; Kokomo, Ind., 30; Minnequa, Colo., 14; Monessen, Pa. (except bale ties), 18; Pittsburg, Calif., 24; Portsmouth, Ohio, 20; Rankin, Pa. (except bale ties), 2; Sparrows Point (except woven fence), 3; Sterling, Ill., 33; San Francisco (except nails and woven fence), 14; Torrance, Calif. (nails only), 24; Worcester (nails only), 2.

Fence posts: Duluth, 2; Johnstown, Pa., 3; Joliet, Ill., 2; Minnequa, Colo., 14; Moline, Ill., 4; Williamsport, Pa., 51.

Cut nails: Wheeling, W. Va., 15; Conshohocken, Pa., 26.

CLAD STEEL

Base prices, cents per pound, f.o.b. mill

	Plate	Sheet
Stainless-carbon		
No. 304, 20 pct,		
Coatesville, Pa. (21)	*26.50	
Washgtn, Pa. (39)	*26.50	*22.50
Claymont, Del. (29)	*26.50	
Conshohocken, Pa. (26)		*22.50
New Castle, Ind. (55)	*26.50	*24.00
Nickel-carbon		
10 pct, Coatesville, (26)	27.50	
Inconel-carbon		
10 pct, Coatesville, (21)	36.00	
Monel-carbon		
10 pct, Coatesville, (21)	29.00	
No. 302 Stainless-copper-stainless, Carnegie, Pa. (41)		75.00
Aluminized steel sheets, hot dip, Butler, Pa., (7)		7.75

* Includes annealing and pickling, or sandblasting.

ELECTRICAL SHEETS

24 gage, HR cut lengths, f.o.b. mill

	Cents per lb
Armature	5.45
Electrical	5.95
Motor	6.70
Dynamo	7.50
Transformer 72	8.05
Transformer 65	8.60
Transformer 58	9.30
Transformer 52	10.10

PRODUCING POINTS—Beech Bottom, W. Va., 18; Brackenridge, Pa., 28; Butler, Pa., 7; Follansbee, W. Va., 63; Granite City, Ill., 22; Indiana Harbor, Ind., 8; Mansfield, Ohio, 75; Niles, Ohio, 64, 76; Toronto, Ohio, 63; Vandergrift, Pa., 1; Warren, Ohio, 4; Zanesville, Ohio, 7.

Numbers after producing points correspond to steel producers. See key on previous page.

BOLTS, NUTS, RIVETS, SET SCREWS

Consumer Prices

(Bolts and nuts f.o.b. mill Pittsburgh, Cleveland, Birmingham or Chicago)

Base discount less case lots

Machine and Carriage Bolts

	Pct Off List
½ in. & smaller x 6 in. & shorter	35
9/16 & ⅝ in. x 6 in. & shorter	37
¾ in. & larger x 6 in. shorter	34
All diam., longer than 6 in.	30
Lag, all diam over 6 in. & longer	35
Lag, all diam x 6 in. & shorter	37
Plow bolts	47

Nuts, Cold Punched or Hot Pressed

(Hexagon or Square)

½ in. and smaller	35
9/16 to 1 in. inclusive	34
1⅛ to 1½ in. inclusive	32
1⅝ in. and larger	27

On above bolts and nuts, excepting plow bolts, additional allowances of 15 pct for full container quantities. There is an additional 5 pct allowance for carload shipments.

Semifinished Hexagon Nuts

	USS	SAE
7/16 in. and smaller	..	41
½ in. and smaller	38	..
½ in. through 1 in.	..	39
9/16 in. through 1 in.	37	..
1⅛ in. through 1½ in.	35	37
1⅝ in. and larger	28	..

In full case lots, 15 pct additional discount.

Stove Bolts

Packages, nuts separate	$61.75
In bulk	70.00

Large Rivets

(½ in. and larger)

	Base per 100 lb
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$6.75
F.o.b. Lebanon, Pa.	6.75

Small Rivets

(7/16 in. and smaller)

	Pct off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	48

Cap and Set Screws

(In packages)	Pct Off List
Hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in., SAE 1020, bright	46
¾ to 1 in. x 6 in., SAE (1035), heat treated	35
Milled studs	19
Flat head cap screws, listed sizes	5
Fillister head cap, listed sizes	28

C-R SPRING STEEL

Base per pound f.o.b. mill

0.26 to 0.40 carbon	4.00¢
0.41 to 0.60 carbon	5.50¢
0.61 to 0.80 carbon	6.10¢
0.81 to 1.05 carbon	8.05¢
1.06 to 1.35 carbon	10.35¢

Worcester, add 0.30¢.

RAILS, TRACK SUPPLIES

F.o.b. mill

Standard rails, 100 lb and heavier, No. 1 quality, per 100 lb	$3.20
Joint bars, per 100 lb	4.25
Light rails per 100 lb	3.55

	Base Price cents per lb
Track spikes	5.35
Axles	5.20
Screw spikes	8.00
Tie plates	4.05
Tie plates, Pittsburgh, Torr., Calif.*	4.20
Track bolts, untreated	8.25
Track bolts, heat treated, to railroads	8.50

*Seattle, add 30¢.

PRODUCING POINTS—*Standard rails:* Bessemer, Pa., 1; Ensley, Ala., 11; Gary, 1; Indiana Harbor, Ind., 8; Lackawanna, N. Y., 3; Minnequa, Colo., 14; Steelton, Pa., 3.

Light rails: All the above except Indiana Harbor and Steelton, plus Fairfield, Ala., 11; Johnstown, Pa. 3.

Joint bars: Bessemer, Pa., 1; Fairfield, Ala., 11; Indiana Harbor, Ind., 8; Joliet, Ill., 1; Lackawanna, N. Y., 3; Steelton, Pa., 3.

Track spikes: Fairfield, Ala., 11; Indiana Harbor, Ind., 6, 8; Lebanon, Pa., 3; Minnequa, Colo., 14; Pittsburgh, 5; Chicago, 4; Struthers, Ohio, 6; Youngstown, 4.

Track bolts: Fairfield, Ala., 11; Lebanon, Pa., 3; Minnequa, Colo., 14; Pittsburgh, 77, 78.

Axles: Fairfield, Ala., 11; Gary, 1; Indiana Harbor, Ind., 79; Johnstown, Pa., 3; McKees Rocks, Pa., 1.

Tie plates: Fairfield, Ala., 11; Gary, 1; Indiana Harbor, Ind., 8; Lackawanna, N. Y., 3; Pittsburg, Calif., 24; Pittsburgh, 4; Seattle, 62; Steelton, Pa., 3; Torrance, Calif., 24.

TOOL STEEL

F.o.b. mill

W	Cr	V	Mo	Co	Base per lb
18	4	1	—	—	90.5¢
18	4	1	—	5	$1.42
18	4	2	—	—	$1.025
1.5	4	1.5	8	—	65¢
6	4	2	6	—	69.5¢

High-carbon-chromium	52¢
Oil hardened manganese	29¢
Special carbon	26.5¢
Extra carbon	22¢
Regular carbon	19¢

Warehouse prices on and east of Mississippi are 2½¢ per lb higher. West of Mississippi, 4½¢ higher.

COKE

	Net Ton
Furnace, beehive (f.o.b. oven) Connellsville, Pa.	$14.00 to $14.50
Foundry, beehive (f.o.b. oven) Connellsville, Pa.	$15.50 to $16.00
Foundry, oven coke	
Buffalo, del'd	$20.90
Chicago, f.o.b.	20.40
Detroit, f.o.b.	19.40
New England, del'd	22.70
Seaboard, N. J., f.o.b.	22.00
Philadelphia, f.o.b.	20.45
Swedeland, Pa., f.o.b.	20.40
Plainesville, Ohio, f.o.b.	20.90
Erie, del'd	$20.25 to 21.04
Cleveland, del'd	22.62
Cincinnati, del'd	21.71
St. Paul, f.o.b.	23.50
St. Louis, del'd.	21.60
Birmingham, del'd	18.75

FLUORSPAR

Washed gravel fluorspar, f.o.b. cars, Rosiclare, Ill. Base price, per ton net: Effective CaF, content:

70% or more	$37.00
60% or less	34.00

WAREHOUSE PRICES

Base prices, f.o.b warehouse, dollars per 100 lb.
(Metropolitan area delivery, add 15c to base price except Cincinnati and New Orleans (*), add 10c; New York, Chicago and Boston, add 20c.)

CITIES	SHEETS			STRIP		PLATES	SHAPES	BARS		ALLOY BARS			
	Hot-Rolled	Cold-Rolled (15 gage)	Galvanized (10 gage)	Hot-Rolled	Cold-Rolled		Standard Structural	Hot-Rolled	Cold-Finished	Hot-Rolled, A 4615 As-rolled	Hot-Rolled, A 4140-50 Ann.	Cold-Drawn, A 4615 As-rolled	Cold-Drawn, A 4140-50 Ann.
Baltimore	5.31	6.21–6.41	6.95–7.11	5.37	....	5.56	5.38	5.42	6.18	....	9.60–10.10	....	....
Birmingham	4.85	5.75	6.15	4.85	....	5.10	4.90	4.90	6.59	....	....	....	....
Boston	5.55	6.45–6.75	7.11–7.61	5.60	6.75	5.75	5.42	5.52	6.02	9.36–9.67	9.67–9.87	10.72	11.02
Buffalo	4.85	5.75	7.42–7.57	5.24	7.27	5.35	5.00	4.95	5.40	9.30	9.60	10.65	10.95
Chicago	4.85	5.75	6.85	4.85	5.45–6.15	5.10	4.90	4.90	5.40	8.90	9.26	10.25	10.55
Cincinnati*	5.16–5.51	5.84–6.28	6.59–6.93	5.28–5.43	....	5.53–5.85	5.33	5.33–5.48	6.08–6.20	9.74	9.99	11.19	11.44
Cleveland	4.85	5.75	6.70	5.03	....	5.21	5.01	5.01	5.45	9.05	9.35	10.40	10.70
Detroit	5.28–5.32	6.07–6.18	7.38–7.58	5.27–5.47	6.27–6.58	5.52–5.57	5.33–5.40	5.33–5.55	6.00–6.10	9.67	9.92	11.11	11.35
Houston	6.70–6.95	....	7.30	6.70	....	6.70	6.20–6.70	6.40–6.65	7.80	10.45	10.40	11.45	11.70
Indianapolis	5.29	6.13	7.44	5.29	7.36	5.54	5.34	5.34	6.14	11.25	11.39	....	....
Kansas City	5.45	6.35	7.40–7.45	5.45	6.05–6.90[5]	5.70	5.50	5.50	6.05	9.50	8.30	10.85	9.65
Los Angeles	5.45	7.00	7.45	5.95	7.35[10]	5.50	5.45	5.60	7.25	....	....	....	....
Memphis	5.75–5.80	6.60	7.20	5.80–5.95	6.80	5.95–6.00	5.75	5.75	6.53	....	....	....	....
Milwaukee	5.03	5.93	7.02	5.03–5.38	6.32	5.28	5.08	5.08	5.63	9.53	9.73	10.98	11.23
New Orleans*	5.95	6.75	....	6.15	....	6.15	5.95	5.95	6.65[5]	....	....	....	....
New York	5.40	6.31	6.85–6.90	5.62	6.76	5.65	5.33	5.57	6.31	9.28	9.58	10.63	10.93
Norfolk	6.00	....	....	6.20	....	6.05	6.05	6.05	7.05	....	....	....	....
Omaha	6.13	....	8.33	6.13	....	6.38	6.18	6.18	6.98	....	....	....	....
Philadelphia	4.95	6.24[13]	6.63	5.40	6.29	5.35	5.10	5.40	5.96	9.05	9.35	10.62	10.87
Pittsburgh	4.85	5.75	6.90	5.00	6.00	5.05	4.90	4.90	5.40	8.90	9.20	10.25	10.55
Portland	6.50[5]–7.05	8.00	8.80–9.10	6.85[5]	....	6.30[5]	6.35[5]	6.35[5]	8.25[14]	10.50[6]	10.10[6]	....	....
Salt Lake City	7.05	7.05	8.65	7.45[3]	....	5.65[3]	5.50[3]	7.10[5]	8.15	....	....	....	....
San Francisco	6.15[5]	7.50[2]	8.65–7.80	6.75[5]	8.25[5]	6.35[5]	5.90[5]	5.90[5]	7.55	9.80	10.00	11.20	11.60
Seattle	6.70[4]–7.10	8.15[2]–8.65	8.80–9.30	6.70[4]	....	6.35[4]	6.30[4]	6.20[4]	8.15[14]	....	10.35[15]	....	13.10[15]
St. Louis	5.22–5.37	6.12–6.27	7.32	5.22	6.68–7.54	5.47	5.27	5.27	5.82	9.27–9.72	9.57–9.97	10.62–11.17	10.92–11.42
St. Paul	5.44	6.19–6.34	7.54–7.64	5.44	6.82	5.64–6.69	5.49	5.49	6.04	9.49	9.79	10.84	11.14

BASE QUANTITIES *Standard unless otherwise keyed on prices.*

Hot-Rolled:
Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

Cold-Rolled:
Sheets, 400 to 1499 lb strip, extras on all quantities. Bars 1000 lb and over.

Alloy Bars:
1000 to 1999 lb.

Galvanized Sheets:
450 to 1499 lb.

Exceptions:
(1) 400 to 1499 lb; (2) 450 to 1499 lb; (3) 300 to 4999 lb; (4) 300 to 9999 lb; (5) 2000 lb and over; (6) 1000 lb and over; (7) 400 to 14,999 lb; (8) 400 lb and over; (9) 500 to 1999 lb; (10) 500 to 999 lb; (11) 400 to 3999 lb; (12) 450 to 3749 lb; (13) 400 to 1999 lb; (14) 1500 lb and over; (15) 1000 to 4999 lb; (16) 4000 lb and over; (17) up to 1999 lb; (18) 1000 to 1499 lb; (19) 1500 to 3499 lb; (20) 6000 lb and over.

PIG IRON PRICES

Dollars per gross ton. Delivered prices do not include 3 pct tax on freight.

PRODUCING POINT PRICES

Producing Point	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Bethlehem	48.00	48.50	49.00	49.50	.....
Birmingham	38.88	39.38	.....	.....	.....
Buffalo	46.00	46.50	47.00	.....	.....
Chicago	46.00	46.50	46.50	47.00	.....
Cleveland	46.00	46.50	46.50	47.00	51.00
Duluth	46.00	46.50	46.50	47.00	.....
Erie	46.00	46.50	46.50	47.00	.....
Everett		50.50	51.00	.....	.....
Granite City	47.90	48.40	48.90	.....	.....
Ironton, Utah	46.00	46.50	.....	.....	.....
Lone Star, Texas	46.00	46.50†	.....	.....	.....
Pittsburgh	46.00	46.50	46.50	47.00	.....
Geneva, Utah	46.00	46.50	.....	.....	.....
Sharpsville	46.00	46.50	46.50	47.00	.....
Steelton	48.00	48.50	49.00	49.50	54.00
Struthers, Ohio	46.00	.....	.....	.....	.....
Swedeland	48.00	48.50	49.00	49.50	.....
Toledo	46.00	46.50	46.50	47.00	.....
Troy, N. Y.	48.00	48.50	49.00	.....	54.00
Youngstown	46.00	46.50	46.50	47.00	.....

DELIVERED PRICES (BASE GRADES)

Consuming Point	Producing Point	Rail Freight Rate	Basic	No. 2 Foundry	Malleable	Bessemer	Low Phos.
Boston	Everett	$0.50 Arb.	.....	50.50	51.00	.....	.....
Boston	Steelton	6.90	.....	.....	.....	.....	60.90
Brooklyn	Bethlehem	4.29	.....	52.79	53.29	53.79	.....
Cincinnati	Birmingham	8.70	45.58	46.08	.....	.....	.....
Jersey City	Bethlehem	2.63	.....	51.13	51.63	52.13	.....
Los Angeles	Geneva-Ironton	7.70	53.70	54.20	.....	.....	.....
Mansfield	Cleveland-Toledo	3.33	49.33	49.83	49.83	50.33	54.33
Philadelphia	Bethlehem	2.39	50.39	50.89	51.39	51.89	.....
Philadelphia	Swedeland	1.44	49.44	49.94	50.44	50.94	.....
Philadelphia	Steelton	3.09	.....	.....	.....	.....	57.09
Rochester	Buffalo	2.63	48.63	49.13	49.63	.....	.....
San Francisco	Geneva-Ironton	7.70	53.70	54.20	.....	.....	.....
Seattle	Geneva-Ironton	7.70	53.70	54.20	.....	.....	.....
St. Louis	Granite City	0.75 Arb.	48.65	49.15	49.65	.....	.....
Syracuse	Buffalo	3.58	49.58	50.08	50.58	.....	.....
Gulf Ports	Lone Star, Texas	.....	50.50	51.00†	.....	.....	.....

† Low Phos., Southern Grade.

Producing point prices are subject to switching charges; silicon differential (not to exceed 50c per ton for each 0.25 pct silicon content in excess of base grade which is 1.75 to 2.25 pct for foundry iron); phosphorus differentials, a reduction of 38c per ton for phosphorus content of 0.70 pct and over manganese differentials, a charge not to exceed 50c per ton for each 0.50 pct manganese content in excess of 1.00 pct. $2 per ton extra may be charged for 0.5 to 0.75 pct nickel content and $1 per ton extra for each additional 0.25 pct nickel.

Silvery iron (blast furnace) silicon 6.01 to 6.50 pct. C/L per g.t., f.o.b. Jackson, Ohio—$59.50; f.o.b. Buffalo, $60.75. Add $1.00 per ton for each additional 0.50 pct Si up to 17 pct. Add 50c per ton for each 0.50 pct Mn over 1.00 pct. Add $1.00 per ton for 0.75 pct or more P. Bessemer ferrosilicon prices are $1.00 per ton above silvery iron prices of comparable analysis.

Charcoal pig iron base price for low phosphorus $60.00 per gross ton, f.o.b. Lyle, Tenn. Delivered Chicago, $68.56. High phosphorus charcoal pig iron is not being produced.

IMPORTED ORES

Beryllium Ore

Imported ore, 10 to 12% BeO, $25 to $27 per short ton unit, c.i.f. U. S. ports.

Chrome Ore

Imported ore, per gross ton, dry basis, subject to penalties if guarantees are not met, f.o.b. cars, New York, Philadelphia, Baltimore, Charleston, S. C., plus ocean freight differential for delivery to Portland, Ore., and/or Tacoma, Wash.

Indian and African	
48% Cr_2O_3, 3 to 1 ratio	$39.00
48% Cr_2O_3, 2.8 to 1 ratio	37.50
48% Cr_2O_3, no ratio	31.00
Philippine Islands	
48% Cr_2O_3, 3 to 1 ratio	$39.00 to 41.00
Rhodesian	
48% Cr_2O_3, 3 to 1 ratio	$39.00
48% Cr_2O_3, no ratio	30.00
45% Cr_2O_3, no ratio	$27.00 to 27.50
South African (Transvaal)	
50% Cr_2O_3, no ratio	$29.50 to 30.50
48% Cr_2O_3, no ratio	29.00 to 30.00
45% Cr_2O_3, no ratio	26.50
44% Cr_2O_3, no ratio	25.50 to 26.00
Turkish	
48% Cr_2O_3, 3 to 1 ratio	$35.00 to 41.00
Domestic	
48% Cr_2O_3, 3 to 1 ratio, f.o.b. nearest shipping point	$39.00

Manganese Ore

On long-term contracts involving large tonnages prices are nominal and subject to other factors of negotiation. Nearby business, basis 48% Mn, duty paid, 81.8¢ to 83.8¢ per long ton unit, c.i.f. U. S. ports. Prices on lower grade ore is adjusted to the Mn content and may be subject to penalties according to the content of impurities.

Titanium Ore

Imported ore, ilmenite, 56 to 59% TiO_2, c.i.f. Atlantic seaboard, $16 to $18 per gross ton, according to grade and impurities. Rutile, granular form, per lb, guaranteed minimum 94 to 96% concentrate, $90 to $100 per short ton, c.i.f. carload lots, Atlantic seaboard.

Note — Prices on many foreign ores show fluctuations that are dependent on quality, quantity, commissions, delivery and other factors of negotiation. Quotations are considered representative, but may be subject to penalties or premiums, according to the content of impurities, etc.

Short ton unit equals 20.0 lb.

Long ton unit equals 22.4 lb.

Ore prices per ton are calculated by multiplying the price per unit of contained metal by the number of units per ton. The number of units per ton is the percentage figure.

LAKE SUPERIOR ORES

(51.50% Fe; natural content, delivered lower lake ports)

	Per gross ton
Old range, bessemer	$7.60
Old range, nonbessemer	7.45
Mesabi, bessemer	7.35
Mesabi, nonbessemer	7.20
High phosphorus	7.20

REFRACTORIES

(F.o.b. works)

Fire Clay Brick

	Carloads, Per 1000
First quality, Pa., Ky., Mo., Ill. (except Salina, Pa., add $5)	$80.00
No. 1 Ohio	74.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	74.00
No. 2 Ohio	66.00
Ground fire clay, net ton, bulk (except Salina, Pa., add $1.50)	11.50

Silica Brick

Mt. Union, Pa., Ensley, Ala.	$80.00
Childs, Pa.	84.00
Hays, Pa.	85.00
Chicago District	89.00
Western, Utah and Calif.	95.00
Super Duty, Hays, Pa., Athens, Tex.	$85.00 to 95.00
Silica cement, net ton, bulk, Eastern (except Hays, Pa.)	$13.75 to 14.00
Silica cement, net ton, bulk, Hays, Pa.	16.00
Silica cement, net ton, bulk, Ensley, Ala.	15.00
Silica cement, net ton, bulk, Chicago District	$14.75 to 15.00
Silica cement, net ton, bulk, Utah and Calif.	21.00

Chrome Brick

	Per Net Ton
Standard chemically bonded, Balt., Chester	$69.00

Magnesite Brick

Standard, Balt. and Chester	$91.00
Chemically bonded, Balt. and Chester	80.00

Grain Magnesite

Std. ⅜-in. grains

Domestic, f.o.b. Balt. and Chester, in bulk, fines removed	$56.00 to 56.50
Domestic, f.o.b. Chewelah, Wash., in bulk with fines	$30.50 to 31.00
in sacks with fines	35.00 to 35.50

Dead Burned Dolomite

F.o.b. producing points in Pennsylvania, West Virginia and Ohio, per net ton, bulk, Midwest, add 10¢; Missouri Valley, add 20¢ | $12.25

METAL POWDERS

Per pound, f.o.b. shipping point, in ton lots, for minus 100 mesh.

Swedish sponge iron c.i.f. New York, ocean bags	7.4¢ to 9.0¢
Domestic sponge iron, 98+% Fe, carload lots	9.0¢ to 15.0¢
Electrolytic iron, annealed, 99.5+% Fe	31.5¢ to 39.5¢
Electrolytic iron, unannealed, minus 325 mesh, 99+% Fe	48.5¢
Hydrogen reduced iron, minus 300 mesh, 98+% Fe	63.0¢ to 80.0¢
Carbonyl iron, size 5 to 10 microns, 98%, 99.8%+ Fe	90.0¢ to $1.75
Aluminum	27.00¢
Antimony	53.78¢
Brass, 10 ton lots	22.75 to 25.25¢
Copper, electrolytic	27.75¢
Copper, reduced	27.625¢
Cadmium	$2.40
Chromium, electrolytic, 99% min.	$3.50
Lead	21.55¢
Manganese	48.00¢
Molybdenum, 99%	$2.65
Nickel, unannealed	66.00¢
Nickel, spherical, minus 30 mesh, unannealed	68.00¢
Silicon	34.00¢
Solder powder	8.5¢ plus metal cost
Stainless steel, 302	75.00¢
Tin	$1.15 to $1.25
Tungsten, 99%	$2.90
Zinc, 10 ton lots	15.50 to 18.25¢

ELECTRODES

Cents per lb. f.o.b. plant, threaded electrodes with nipples, unboxed

Diameter in in.	Length in in.	
Graphite		
17, 18, 20	60, 72	16.00¢
8 to 16	48, 60, 72	16.50¢
7	48, 60	17.75¢
6	48, 60	19.00¢
4, 5	40	19.50¢
3	40	20.50¢
2½	24, 30	21.00¢
2	24, 30	23.00¢
Carbon		
40	100, 110	7.50¢
35	85, 110	7.50¢
30	85, 84, 110	7.50¢
24	72 to 104	7.50¢
17 to 20	84, 90	7.50¢
14	60, 72	8.00¢
10, 12	60	8.25¢
8	60	8.50¢

Du Pont Reports on Titanium

Atlantic City, N. J.—E. I. Du Pont de Nemours & Co. engineers have succeeded in making 400-lb titanium ingots and the company is prepared to make them regularly. This improvement was reported in a paper presented by E. A. Gee of du Pont at the 116th national meeting of the American Chemical Society here recently.

With Dr. Gee, J. B. Sutton and W. J. Barth were co-authors of the paper which described du Pont's progress in titanium during the first year of operation to the point where it can now produce commercial quality metal day in and day out. First ingots weighed 10 lb. Then 100-lb ingots were produced and the plant has now succeeded in making 400-lb ingots.

Du Pont makes its titanium metal near Wilmington, Del., and does fabricating and similar work on it at its Bridgeport, Conn., subsidiary, Remington Arms Co. Commercially pure titanium is sold by du Pont at $5.00 per lb in sponge form for 100 lb or more and $7.50 per lb in ingot form for 100 or more lb.

Lead Production Unchanged

Toronto—Canadian production of primary lead in all forms and the recoverable lead content in ores during June 1949, amounted to 14,223 tons, compared with 17,940 tons in May and with 11,317 tons in June 1948. Total recovery for the first half of this year was 74,679 tons against 74,538 tons in the first 6 months of 1948.

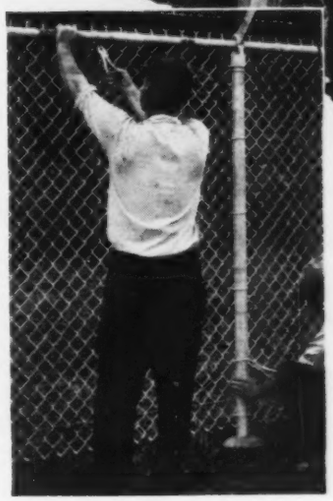
Exports of refined lead for June were 9472 tons valued at $2,920,681 a decrease from 10,430 tons valued at $3,766,189 in the previous months. Total exports for the first 6 months this year amounted to 55,814 tons.

The ONLY FENCE MADE OF KONIK STEEL

● Continental Chain Link, the only fence made of KONIK steel, gives you greatest protection at lowest cost per year of fence life. KONIK is a special patented open hearth steel containing copper, nickel and chromium for greater strength—for extra long-lasting resistance to rust and corrosion. After the weaving of Continental Chain Link the KONIK fabric is dipped in a special galvanizing bath which spreads a uniform coating of weatherproofing zinc over every inch of the fence wire. Continental Chain Link fence of KONIK steel is the most permanent and economical protection your property can have. It will pay you to contact our nearest representative or call us at Kokomo, Indiana.

We'll Help You...

Continental Chain Link fence is "tailored" to fit your own protection needs. Our experienced fence engineers stand ready to plan and help erect the type of fence that will serve you best. They will work with you in laying out the most effective and economical installation to harmonize with the character of your property. And remember, when you install Continental Chain Link, you get 14 distinctive advantages including stronger and smoother-operating gates . . . improved pivot-type hinges . . . self-locking barb arms . . . 20% more ties . . . full gage wire of KONIK steel.



WRITE FOR FREE FENCE MANUAL: A card will bring your copy of "Planned Protection"—a complete manual on modern protection and control of property. Contact the Continental Steel Corporation, or nearest sales office.

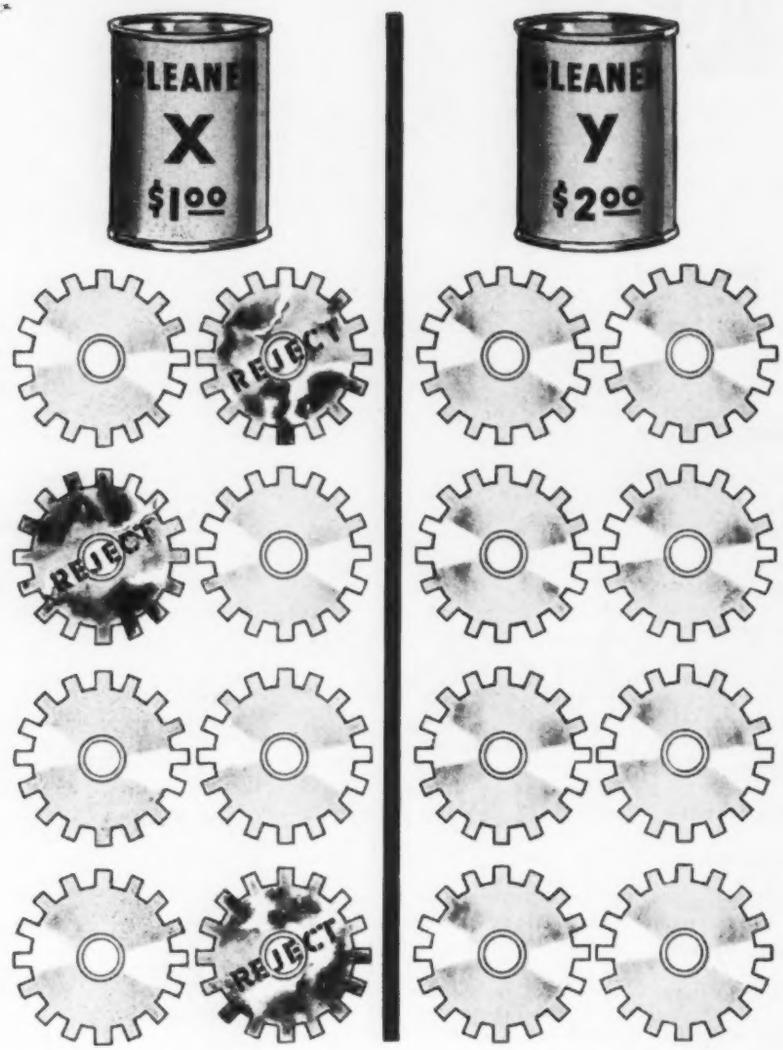
CONTINENTAL STEEL

CONTINENTAL STEEL CORPORATION

GENERAL OFFICES • KOKOMO, INDIANA

PRODUCERS OF *Manufacturer's Wire* **in many sizes, shapes, tempers and finishes, including Galvanized, KOKOTE, Flame-Sealed, Coppered, Tinned, Annealed, Liquor Finished, Bright, Lead Coated, and special wire. ALSO, Coated and Uncoated Steel Sheets, Nails, Continental Chain Link Fence, and other products.**

WHICH COSTS MORE?



Two brands of metal cleaners, designed to do the same job, often produce altogether different results. One may sell for less and still cost far more to use in the long run.

Your best guarantee of economy and quality in the cleaning products you buy is the reputation of their maker. Proved cleaners help insure *your* products against rejects and failures in service. This kind of "insurance" pays for itself and earns big dividends for you in repeat orders and customer good-will.

Wyandotte Metal Cleaners are made by the world's largest producer of specialized cleaning compounds. *Balanced* Wyandotte Cleaners are made for soak, electrolytic, spray and tumble operations, as well as for degreasing, paint stripping, burnishing and burring.

All of these up-to-date products meet exacting performance specifications. Fifty-nine years of experience stand behind their Wyandotte trademark. No matter what your cleaning needs may be, it will pay you to call your nearest Wyandotte Representative. If you have some unusual problem, our skilled technical service staff will be glad to help you.

Wyandotte Chemicals Corporation
WYANDOTTE, MICHIGAN
SERVICE REPRESENTATIVES IN 88 CITIES

Wyandotte
REG. U. S. PAT. OFF.

Iron Age Introduces

Continued from Page 25

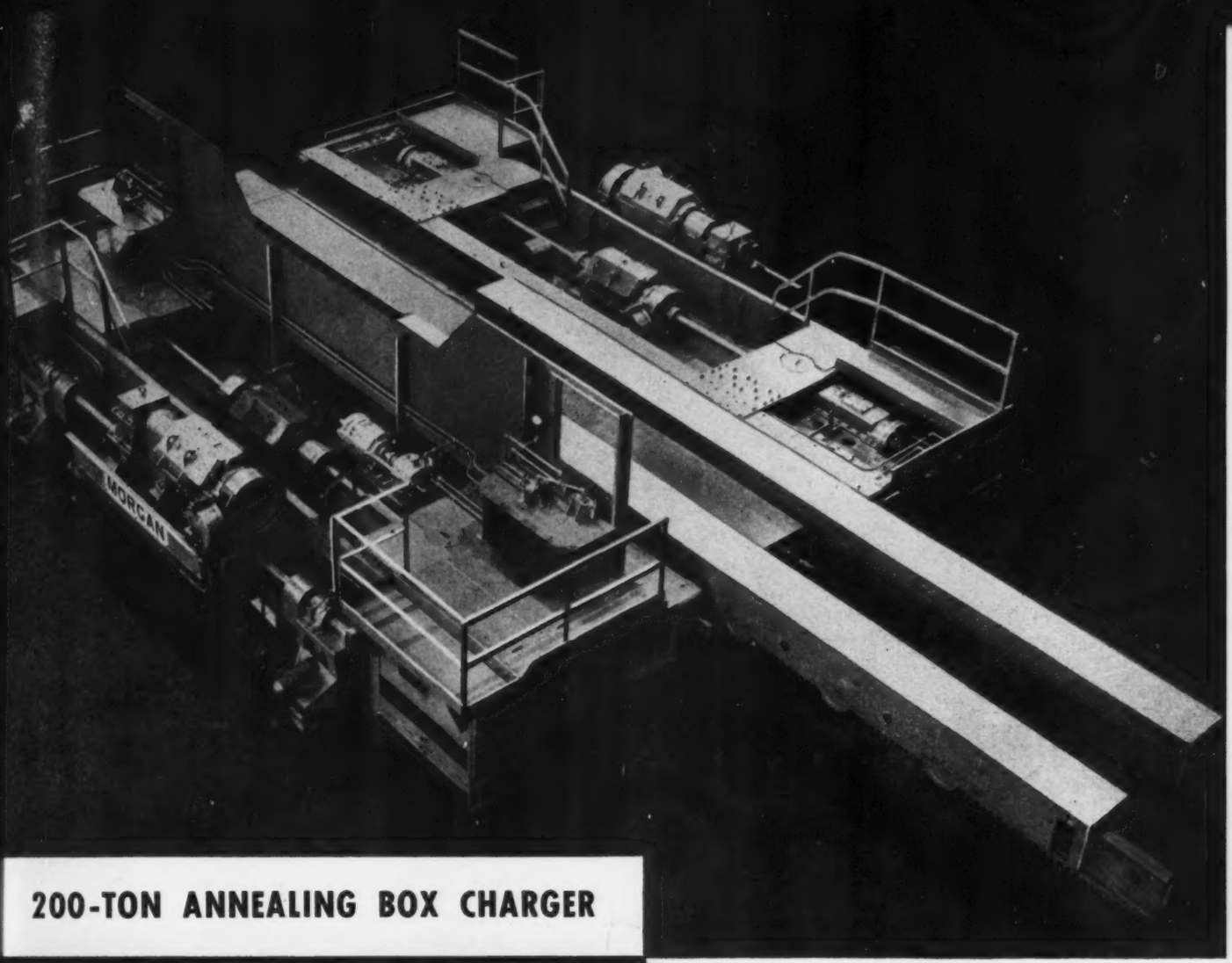
Frederick Wenzel has been named works manager of the TRENT TUBE CO., East Troy, Wis., a subsidiary of the Crucible Steel Co. of America. Prior to his present appointment, Mr. Wenzel was plant superintendent for the company. **W. C. Christianson** was appointed sales manager for the firm. Mr. Christianson joined Trent in 1946 as assistant sales manager.

H. S. PETERS, central district sales manager, The Giddings & Lewis Machine Tool Co.

H. S. Peters has been appointed central district sales manager with headquarters in Detroit for the GIDDINGS & LEWIS MACHINE TOOL CO., Fond du Lac, Wis. Mr. Peters succeeds the late **A. E. Ulrich.**

James L. Conlon has been appointed general manager of the Ternstedt Div. of GENERAL MOTORS CORP., N. Y., to succeed **John W. Jackson,** who is now on leave of absence. Mr. Conlon has been resident manager of the Ternstedt Div. since 1945. **Paul L. Jones** succeeds Mr. Conlon as resident manager at the Columbus Plant.

Russell R. Thompson has been named executive engineer in charge of design and development for the McINERNEY SPRING & WIRE CO., Grand Rapids. Mr. Thompson has had more than thirty years' experience in the automotive industry, and during the years immediately preceding the war, served as the company's product engineer and liaison engineer.



200-TON ANNEALING BOX CHARGER

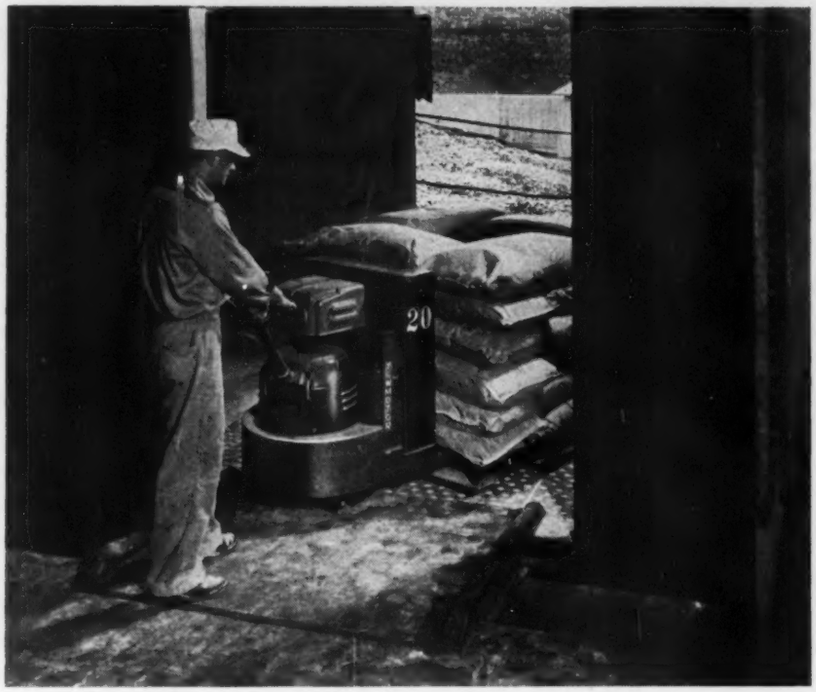
BUILT BY MORGAN Engineering

Illustrated is a Morgan 200-Ton, 5-motor, 19′-3½″ Span Annealing Box Charger. It consists of a traveling bridge upon which are mounted two rack driven charging trucks operating in unison for raising the annealing boxes and moving them into or out of the furnace or onto the cooling beds. The charging trucks are operated by two motors through four worm units with provision for operating either of the two motors alone.

THE MORGAN ENGINEERING CO.

ALLIANCE, OHIO PITTSBURGH—1420 OLIVER BUILDING

DESIGNERS • MANUFACTURERS • CONTRACTORS • BLOOMING MILLS • PLATE MILLS • STRUCTURAL MILLS • ELECTRIC TRAVELING CRANES • CHARGING MACHINES • INGOT STRIPPING MACHINES • SOAKING PIT CRANES • ELECTRIC WELDED FABRICATION • LADLE CRANES • STEAM HAMMERS • STEAM HYDRAULIC FORGING PRESSES • SPECIAL MACHINERY FOR STEEL MILLS



TOWMOTOR Electric Pallet Truck

selected by WRIGLEY

for speed . . . maneuverability . . . ruggedness

Producing millions of sticks of chewing gum *every day*—billions every year—necessitates the unloading, storing and transporting of a staggering amount of materials. This is the problem at the Wm. Wrigley Jr. Company's giant Chicago plant—the world's largest chewing gum factory.

To help maintain top efficiency in a competitive industry, Wrigley must be constantly alert to new developments in the materials handling field. That's why Wrigley selected Towmotor Electric Pallet Trucks to augment its handling equipment.

One of the gruelling tasks is to transport and store 2400-lb. pallet loads on an inclined floor. The floor is rough board surface at an 8° angle. Towmotor is the only truck with enough power to handle full loads rapidly over this area!

In actual operation, Towmotor travels *faster* under *heavier* loads . . . weighs less, carries more . . . climbs grades more readily . . . stands up under constant daily use.

Check these outstanding Towmotor features:

- **Dual Finger-tip Control—either hand.**
- **Positive Brake—vertical and horizontal.**
- **Automatic power cut-off when brake is applied.**
- **Rapid lifting of loads up to 4000 lbs.**
- **3 Point Suspension—for smooth travel, easy maneuverability.**

Write for the descriptive folder on Towmotor Electric Pallet Trucks. Learn how Towmotor **M**ass **H**andling methods can cut production costs and save money for you. Towmotor Corp., Division 15, 1226 East 152nd St., Cleveland 10, Ohio. Representatives in all Principal Cities in U. S. and Canada.

TOWMOTOR
THE ONE-MAN-GANG®

FORK LIFT TRUCKS and TRACTORS

RECEIVING • PROCESSING • STORAGE • DISTRIBUTION

IRON AGE INTRODUCES

Continued

Robert Price has been named representative for the AUTOLITE BATTERY CORP., Toledo. Mr. Price will be situated in the New York Metropolitan area, and succeeds the late **Steven Johnson**, who died last May.

NILS ANDERSON, JR., vice-president, Debevoise-Anderson Co.

Nils Anderson, Jr., has joined the DEBEVOISE-ANDERSON CO., N.Y., as vice-president. Prior to his present position, Mr. Anderson was vice-president of the Borden Co.'s chemical division.

David S. Holbrook has been elected executive vice-president of ALGOMA STEEL CORP., LTD., Sault Ste. Marie, Canada, and has also been named to the board of directors. Mr. Holbrook was formerly with the Homestead Plant, Carnegie - Illinois Steel Corp., and came to Algoma as assistant general manager in 1944.

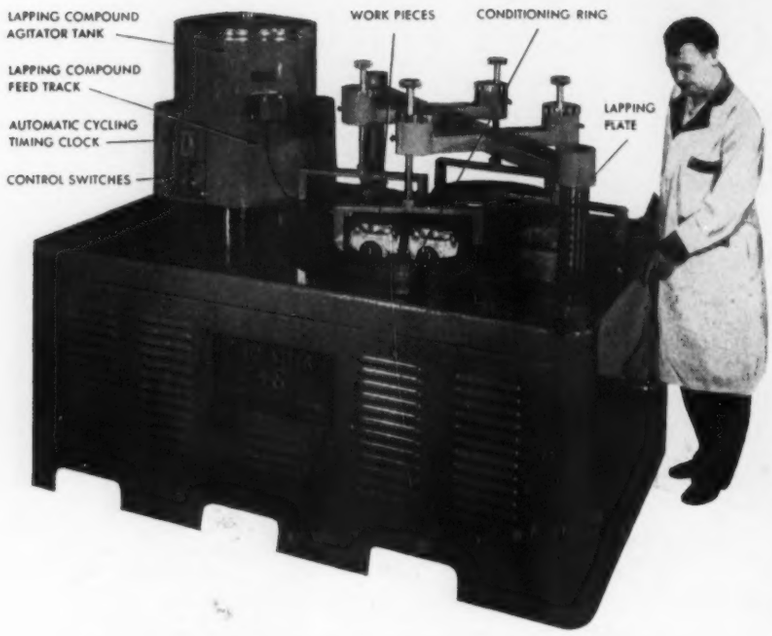
R. A. Gopel has been named manager of sales training for KOPPERS CO., INC., Pittsburgh. Mr. Gopel was formerly district merchandise manager in Baltimore for the Westinghouse Electric Supply Co.

Elmer J. Hanson has been appointed general manufacturing manager of the Fisher Body Div. of GENERAL MOTORS CORP., Detroit. Mr. Hanson has been promoted to fill the vacancy created by **J. J. Cronin**, who was

Saves Time... Cuts Costs
Big Sawing • • • production cutting of large stock —rapid, easy, straight-to-a-line piece after piece—on Espen-Lucas Cold Sawing Machines.
Rotary Planer • • • do milling jobs in one-third to one-seventh of time on an Espen-Lucas Rotary Planer.
The ESPEN-LUCAS Machine Works
Front Street and Girard Ave., Phila. 23, Pa.
BUILDERS OF LARGE COLD SAWING MACHINES • ROTARY PLANERS • COLUMN FACERS • HEAVY TYPES OF SPECIAL MACHINERY

PRECISION LAPPING *plus* PRODUCTION SAVINGS!

with the new method Lapmaster "48"



- **The lapping plate of the LAPMASTER is automatically conditioned during the lapping cycle . . . no lost time for re-surfacing.**
- **The LAPMASTER quickly laps any soft or hard metals of various sizes and shapes . . . it handles many metal and non-metal parts never before finished by precision surface machines (ceramics, plastics, etc.).**
- **The lapping cycle of the LAPMASTER is automatically controlled . . . skilled labor is not necessary.**

The new "John Crane" Lapmaster is a revolutionary step in production precision lapping.

This machine answers your need for obtaining precision surfaces, at a low production cost. It is easily accessible, simple to operate, and permits continuous lapping without the necessity of down-time for lap re-conditioning and reloading. In one cycle, it will precision lap such diversified work as hydraulic parts, torque converter parts, bearing faces of pump gears, mechanical seal parts and gauge blocks—all to a flatness of .0000116" and a surface finish of 2 RMS or less.

Efficiency of the Lapmaster is so great that users have found it is frequently faster than both grinding and de-burring operations which it eliminates.

The Model "48" Lapmaster has a 48" lapping plate. Lapmasters are manufactured with lapping plate diameters of 12", 24", 36", 48", 60" and 72".

Write, on your letterhead, for a copy of our new, illustrated Lapmaster booklet: Crane Packing Co., Lapmaster Division, 1804 Cuyler Ave., Chicago 13, Ill.

Be Sure to See

THE LAPMASTER
at the
CLEVELAND METAL SHOW

Lapmaster Models will be operated to show you production precision lapping "first-hand."

BOOTH 836
MAIN EXHIBITION HALL

JOHN CRANE

CRANE PACKING COMPANY
LAPMASTER DIVISION • CHICAGO 13, ILL.
Offices in All Principal Cities in United States and Canada

recently made general manager of the division. **Leslie W. Walker** has been named general sales manager for the Pontiac Motor Div. **Mr. Walker** joined Pontiac in October, 1946, and became parts manager in May 1947. **Joseph A. Ashwell** has retired from active duty as director of purchases for the New Departure Div. of the Corporation, and **Lester A. Lanning** has been named acting general purchasing agent.

JOHN CUSICK, lift truck sales district manager, the Hyster Co.

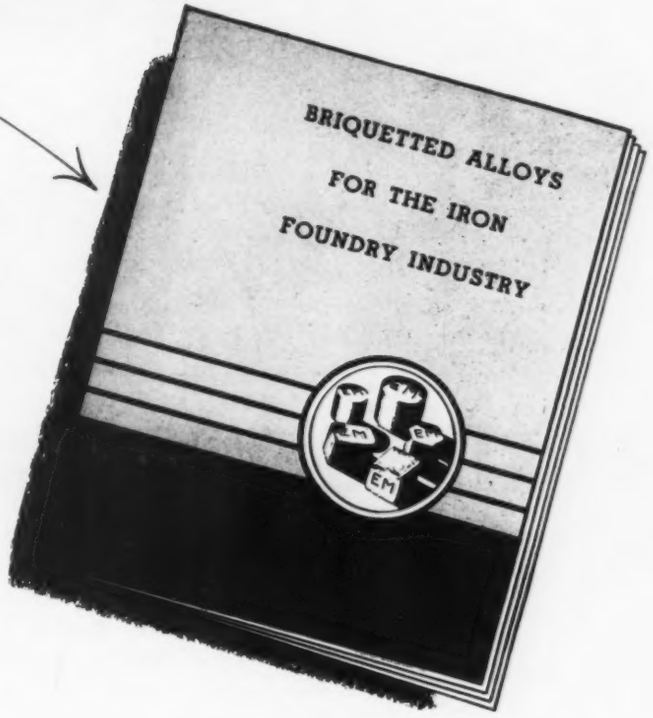
John Mitchell has been promoted to the position of district manager of truck sales for the northeastern section of the country for the HYSTER CO., Portland, Ore. He was formerly retail salesman in the Hyster Chicago store. **John Cusick** has been named lift truck sales district manager responsible for the central portion of the United States. **Mr. Cusick** has been with the company since 1944 and filled various sales positions including work in the export department. Also named to positions as district managers are **W. J. O'Brien** in the southwestern territory, **C. E. Houston** in the northwest district, and **Fred Schultz** in the southeastern part of the United States.

T. James Reed has been appointed plant manager and **M. J. McNicholas** purchasing agent for the Dobbs Ferry Plant of NORTH AMERICAN PHILIPS CO., INC., New York. **Mr. Reed** was formerly connected with Westing-

TO HELP YOU PRODUCE

High-Quality Iron

FREE BOOKLET TELLS HOW CUPOLA ADDITIONS OF ALLOYS IMPROVE FOUNDRY PRACTICE



This new booklet describes in detail:

- How ferro-alloys control the composition of iron and compensate for variations in raw materials.
- The beneficial effects of silicon, manganese, and chromium in cast iron.
- Advantages in using ferro alloy briquets.
- How to calculate the number of briquets to add to the charge.
- How to control carbon, sulphur, and phosphorus.
- Typical cupola charges for soft gray iron, high-strength iron, and low-chromium iron.

24 pages, including tables showing standard cupola charges and iron composition. A real help to all foundrymen.

IMPORTANCE OF ALLOY ADDITIONS TO CAST IRON
TO CONTROL CARBON, SULPHUR, AND PHOSPHORUS
METHOD OF CALCULATING BRIQUET CHARGES

ELECTRO METALLURGICAL DIVISION
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
OFFICES: Birmingham • Chicago • Cleveland • Detroit
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In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

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New York 17, N. Y.

Please send me, without obligation, a copy of "Briquetted Alloys for the Iron Foundry Industry."

Name ..... Title .....
Company .....
Address .....

For Better Use of Yard Space

NORTHERN MAGNET HANDLING, ELECTRIC OVERHEAD TRAVELING CRANES

Higher Speed You can handle more turnover in a given space, or a fixed turnover in less space, with a Northern Electric Overhead Traveling Crane. Desired higher operating speeds are available through various combinations of bridge, trolley, and hoist travel speeds.

Dependability You can make most advantageous use of yard space without fear of crane breakdowns. Yard cranes are purposely built and equipped for rugged, 24-hour continuous service. They have only the heaviest duty type bearings, gears, end trucks, highest quality motors, controls, and other electrical equipment.

Visibility Safer, better, faster load handling and stacking is possible because the operator has better visibility from the Northern Clear Vision Control Cab.

Low Cost Operation Northern Magnet Handling, Electric Overhead Traveling Cranes cost less to operate—have oil bath lubrication which eliminates necessity for daily lubrication and crane idle time—have fewer parts to wear out, fail, or replace.

When you investigate, ask for Bulletin No. 141-C.

OVERHEAD ★ ELECTRIC CRANES ★ AND HOISTS ★

NORTHERN ENGINEERING WORKS
2615 Atwater St., Detroit 7, Mich.

IRON AGE INTRODUCES

Continued

house Electric Corp. and Mr. McNicholas joined North American Philips Co. in 1941, where prior to his promotion he was in charge of production control at the Dobbs Ferry Plant.

LLOYD WOLF, chief engineer, Engineer Dept., Twin Disc Clutch Co., as announced in last week's issue.

William G. Gunlack has been appointed to specialize in stainless steel products for the A. B. MURRAY CO., INC., Elizabeth, N. J. Mr. Gunlack is a sales representative for the company and will be joined in this work by **John J. Lussen**, also a member of the firm's sales department.

David Neill has been appointed Cincinnati sales representative for the FARREL-BIRMINGHAM CO., INC., Ansonia, Conn. Mr. Neill first joined the sales department in 1945, after spending 3 previous years in the company's gear manufacturing division.

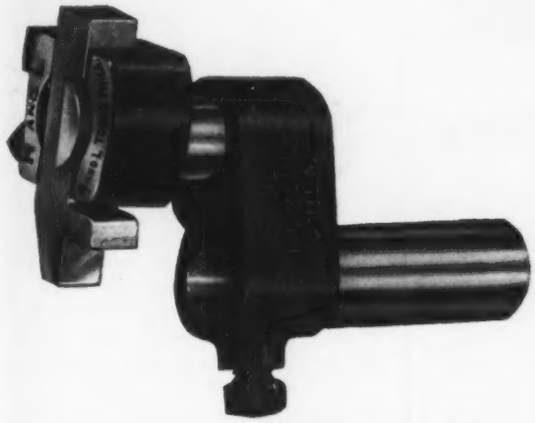
John W. Wack has succeeded **L. R. Wilson** as assistant general freight agent for the WABASH RAILROAD CO., Chicago.

C. A. J. Hadley has been appointed domestic sales manager of the HUDSON MOTOR CAR COMPANY, Detroit, filling the post left vacant by **Norman K. VanDerzee**, who has been promoted to vice-president. Mr. Had-

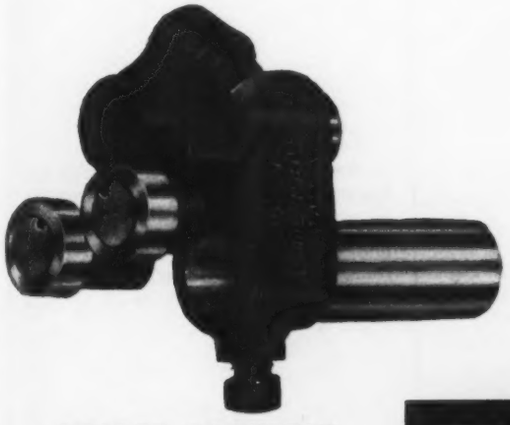
BACKREST HOLDER FOR TURRET

This holder can be fitted with either a Roller Backrest or a Carbide Backrest same as used on our R and L Turning Tools.

If fitted with Angular Cutter Holder same as used on our Turning Tools it makes a substantial single point turning tool, or centering and facing tool.



CARBIDE BACKREST HOLDER



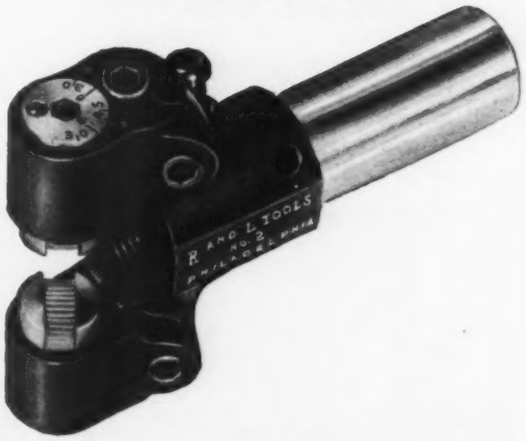
ROLLER BACKREST HOLDER

New Tools For Greater Production

Let R & L Tools help you to cut costs and increase production.

Write for your copy of the idea-packed R & L booklet.

NEW! R AND L KNURLING TOOL



New streamlined design has half the weight of existing tools of comparable size, affords better grip and control of knurls. Available in a complete range of sizes. Only one Hex Wrench needed for all adjustments.

RIGHT R AND L LEFT TOOLS

1825 BRISTOL STREET, Nicetown, Philadelphia 40, Pa.

Photograph courtesy Heintz Manufacturing Company, Phila., Pa.

Pennsalt HF Acid for pickling Stainless Steel

- **removes scale due to heat treating**
- **gives satin finish**
- **economical**
- **easy to use**
- **uniform**

More and more manufacturers of stainless steel products, that use the HF-HNO_3 bath process, are turning to Pennsalt for their hydrofluoric acid and nitric acid. That's because they know that Pennsalt HF and HNO_3 acids fulfill exacting requirements.

Pennsalt Products come to you at a fair price. That's because as a *basic* producer, Pennsalt builds chemicals from the ground up. And to help you with your pickling problems, a complete engineering service is available to you. One word from you puts our 99 years of progressive chemical experience at your call. Write for full details: Heavy Chemicals Division, Pennsylvania Salt Manufacturing Company, Philadelphia 7, Pa.

Pennsalt Anhydrous HF
- **Effective Catalyst**
- **Condensation Reagent**

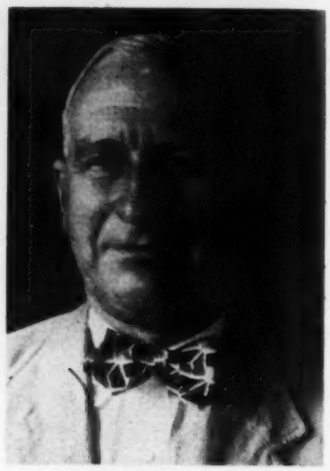
Pennsalt Metal Cleaners
Corrosion-Resistant Cements and Paints

PENN SALT
chemicals

IRON AGE INTRODUCES

Continued

ley joined the organization in 1935 and was the company's north central divisional sales manager at Chicago until 1946.



R. A. J. WELLINGTON, national sales manager, Precision Metalsmiths, Inc., as announced in last week's issue.

M. D. Banus will replace **Albert E. Finholt** on the research staff of METAL HYDRIDES, INC., Beverly, Mass. Dr. Finholt has resigned as associate director to accept an assistant professorship in chemistry at St. Olaf's College.

David I. McCready has joined the sales staff of GRATON & KNIGHT CO., Worcester. Mr. McCready was formerly with Somers, Fitler & Todd Co.

John N. Marshall has been elected to the board of directors of AMERICAN ZINC, LEAD & SMELTING CO., St. Louis. Mr. Marshall, who is chairman of the board of Granite City Steel Co., will fill the vacancy on the board created by the recent death of Hayward Niedringhaus.

W. R. Huber has been named general manager of retail marketing on the managerial staff for the GULF OIL CORP., Pittsburgh, which has reorganized its domestic marketing division. In addition to Mr. Huber's appointment, **D. P. Clark** has been

ARCOS ELECTRODES PAY THEIR WAY...

TAKE ADVANTAGE OF THESE VALUABLE ARCOS SERVICES

Laboratory Research

Quality Control

Field Service

Convenient Stocks

Technical Information

In our long association with stainless fabricators, we have learned that their first and last interest in electrodes is the production of sound weld metal. Arc characteristics, ease of slag removal, bead appearance are all plus qualities easily evaluated but sound welds *on every job* and *from every pound of electrodes* is vital to the user's reputation.

We have further learned, as manufacturers, that stainless electrodes of a quality which will produce sound weld metal *all the time* are achieved only through a considerable expenditure of technical skill in testing and retesting. Arcos electrodes which do not produce trouble-free welds under our strict quality control tests are rejected *before they reach our warehouse.* This extensive care to produce trouble-free electrodes is reflected in the price of Arcos electrodes.

The extensive care in the Arcos processing of electrodes costs more than conventional methods used in the manufacture of low priced steel electrodes but it pays out when it eliminates the costs of chipping and rewelding or failure in service.

The best informed buyers of stainless electrodes specify Arcos.

ELECTRODES • COILED WIRE • BARE ROD

Visit the Arcos Booth #1125 at the Metal Show

WISE ECONOMY • WISE SELECTION of CUTTING FLUIDS • WISE ECONOMY

Learn about the WISE ECONOMY PLAN. Visit the D. A. Stuart booth No. 426 at the National Metal Congress & Exposition or write, wire or phone D. A. Stuart Oil Co., Ltd. for further information. (Telephone BIshop 7-7100.)

D.A. Stuart Oil CO.
EST. 1865 LIMITED

2737 S. Troy St., Chicago 23, Illinois

IRON AGE INTRODUCES

Continued

made general manager, **W. E. Dermody**, advertising manager, **C. E. Skinner**, commercial research manager, and **G. T. Ryan**, operations manager. Named to serve as assistant manager of industrial markets was **H. A. Goddard.**

Willard M. Pearson has been named manager of sales for the BOND CROWN & CORK CO., Wilmington, Del., a Continental Can Co. subsidiary. Mr. Pearson has for many years been connected with organizations in the beverage, food, and equipment fields, and for several years headed his own sales and marketing firm, W. M. Pearson & Associates in Chicago.

OBITUARY

Walter S. Going, 64, vice-president of the Continental Gin Co., Birmingham, died Sept. 17.

Edward J. Roberts, 92, president of the Union Iron Works, Spokane, died Sept. 9.

Benjamin F. Lambert, 61, manager of coke sales for the Diamond Alkali Co., died Sept. 21.

Warren J. Hannum, 65, vice-president and general manager of the Libby Div., International Detrola Co., Indianapolis, died recently.

R. T. Fawcett, president of the Chattanooga Wheelbarrow Co., Chattanooga, Tenn., died Sept. 3.

William Rhoslyn Cunnick, 57, vice-president and general manager of the Great Lakes Steel Corp., Dearborn, died Sept. 18.

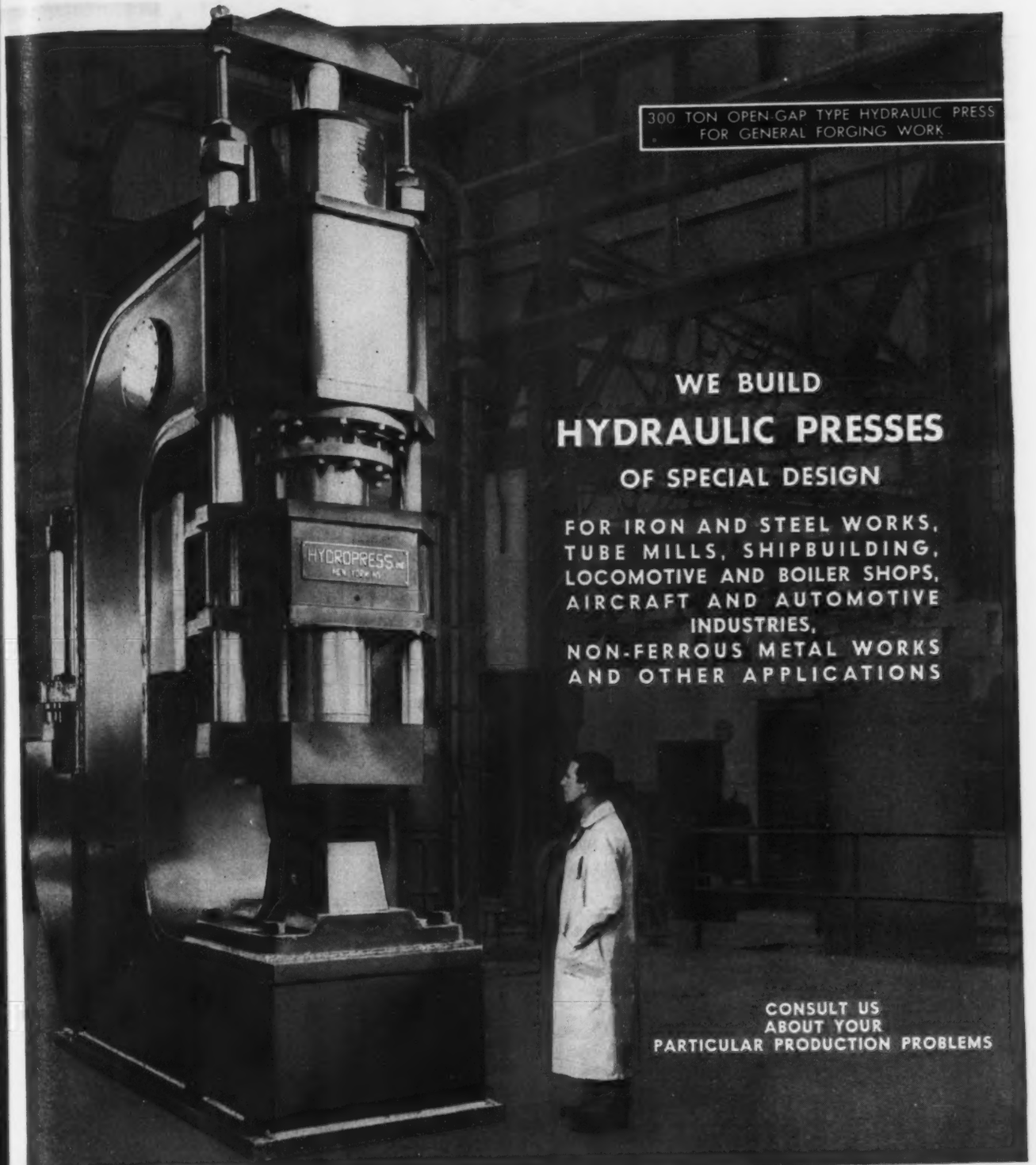
Emil Gathmann, 76, president of Gathmann Research, Inc., the Gathmann Engineering Co., Baltimore, died August 23.

E. L. Lipman, 56, secretary and treasurer of the Inland Steel Products Co., Milwaukee, died Sept. 16.

Bruce E. Tau, vice-president of Freyn Engineering Co., Chicago, died Sept. 24.

Lewis L. Middleton, 62, vice-president of the Sheffield Steel Corp., Kansas City, Mo., died Sept. 19.

Resume Your Reading on Page 26



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ROLLING MILLS

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OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS

BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS.

high strength
real toughness
long wearing
free cutting

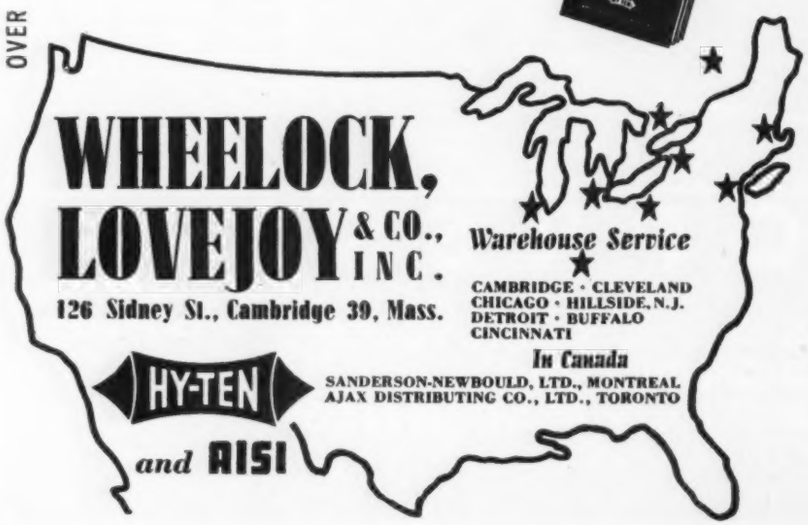
. . . an exceptionally adaptable alloy steel

HY-TEN "B" No. 2 alloy steel combines a high degree of strength, toughness, and fine wearing qualities with *exceptional free-cutting properties* in the natural rolled condition. Think of the economies afforded through the elimination of costs and delays of annealing. This adaptable alloy steel works cleanly and freely – prevents clogging in boring and deep hole drilling. While customarily used in the as-rolled condition, "B" No. 2 is often oil tempered with excellent results.

HY-TEN "B" No. 2 is ideally suited to such applications as tool and die bodies, spindles, shafts, shanks, gears, pinions, racks, worms and lead and feed screws.

WL *steels are metallurgically constant. This guarantees uniformity of chemistry, grain size, hardenability—thus eliminating costly changes in heat treating specifications.*

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.



WHEELOCK, LOVEJOY & CO., INC.

126 Sidney St., Cambridge 39, Mass.

Warehouse Service

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CHICAGO · HILLSIDE, N.J.
DETROIT · BUFFALO
CINCINNATI

In Canada

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AJAX DISTRIBUTING CO., LTD., TORONTO

HY-TEN and AISI

FREE

PUBLICATIONS

Continued from Page 36

and protecting parts against corrosion by metallizing process. *Metallizing Co. of America. For more information, check No. 12 on the postcard on p. 37.*

Magnetic Chucks

Magnetic chucks and other magnetic devices and accessories are featured in bulletin No. 049-1. Illustrations show various equipment and their applications. *Magna-Lock Corp. For more information, check No. 13 on the postcard on p. 37.*

Duct Linings

Fume duct protective linings for plating, pickling and chemical fume removal systems are described in bulletin. Linings are applied by spraying. *Ceilcote Co. For more information, check No. 14 on the postcard on p. 37.*

Gas Plants

Bulletin describes liquefied petroleum gas plants designed for specific conditions. Applications, advantages, design, control, and operating pressures are discussed. *Stacey Dresser Engineering Div., Stacey Bros. Gas Construction Co. For more information, check No. 15 on the postcard on p. 37.*

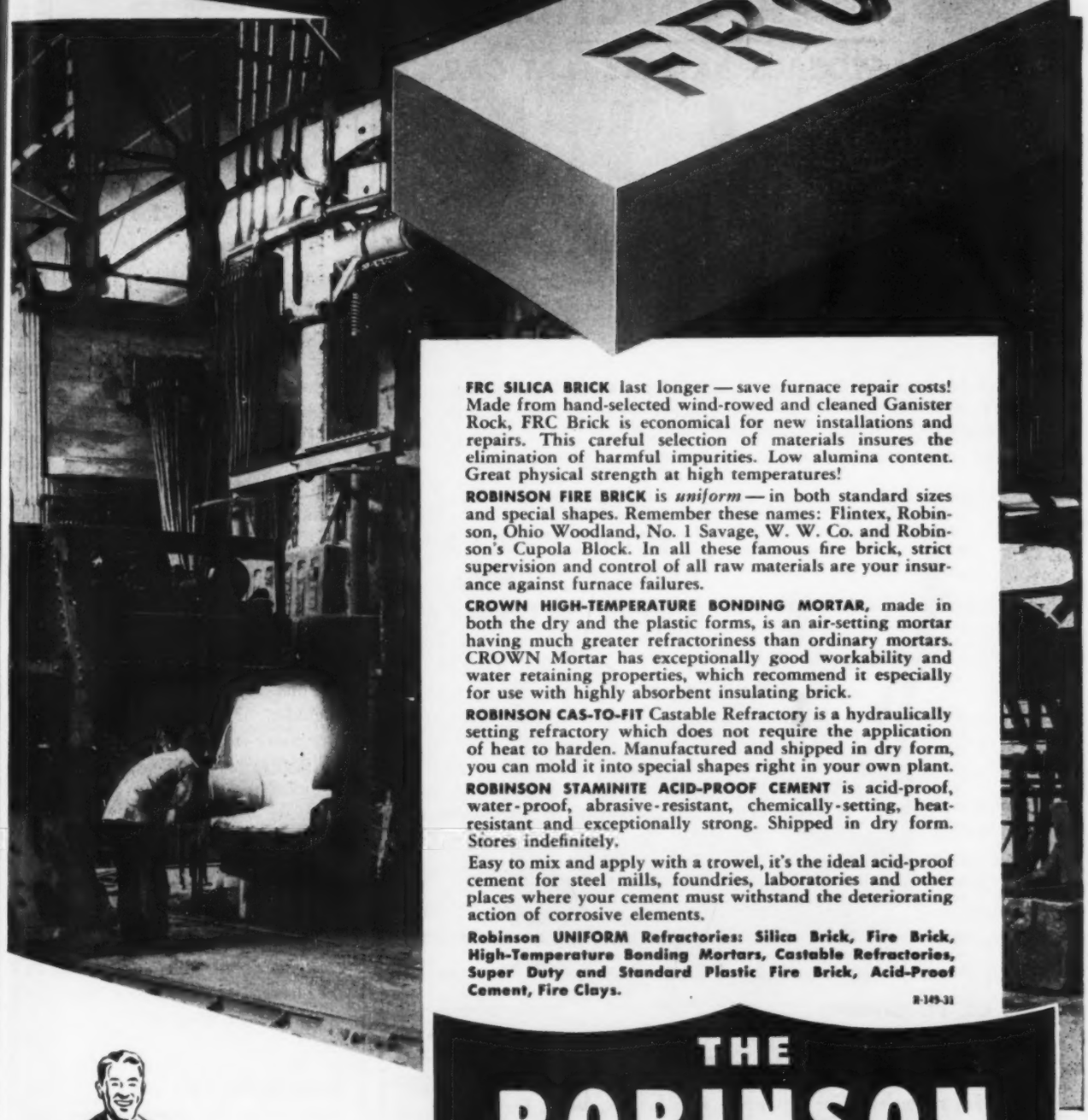
Electrical Connectors

Electrical connectors for battery powered industrial equipment are described in catalog 50B. Included are design, dimensional, capacity and price data. *Albert & J. M. Anderson Mfg. Co. For more information, check No. 16 on the postcard on p. 37.*

Critical Temperatures

Critical points of 85 standard carbon and alloy steels are contained on celluloid pocket card. Includes Ac_1, Ac_3, Ar_3, Ar_1, and Ms temperatures for AISI and SAE types in

REDUCE REPAIR DELAYS
WITH THESE
ROBINSON *Uniform* REFRACTORIES



FRC SILICA BRICK last longer — save furnace repair costs! Made from hand-selected wind-rowed and cleaned Ganister Rock, FRC Brick is economical for new installations and repairs. This careful selection of materials insures the elimination of harmful impurities. Low alumina content. Great physical strength at high temperatures!

ROBINSON FIRE BRICK is *uniform* — in both standard sizes and special shapes. Remember these names: Flintex, Robinson, Ohio Woodland, No. 1 Savage, W. W. Co. and Robinson's Cupola Block. In all these famous fire brick, strict supervision and control of all raw materials are your insurance against furnace failures.

CROWN HIGH-TEMPERATURE BONDING MORTAR, made in both the dry and the plastic forms, is an air-setting mortar having much greater refractoriness than ordinary mortars. CROWN Mortar has exceptionally good workability and water retaining properties, which recommend it especially for use with highly absorbent insulating brick.

ROBINSON CAS-TO-FIT Castable Refractory is a hydraulically setting refractory which does not require the application of heat to harden. Manufactured and shipped in dry form, you can mold it into special shapes right in your own plant.

ROBINSON STAMINITE ACID-PROOF CEMENT is acid-proof, water-proof, abrasive-resistant, chemically-setting, heat-resistant and exceptionally strong. Shipped in dry form. Stores indefinitely.

Easy to mix and apply with a trowel, it's the ideal acid-proof cement for steel mills, foundries, laboratories and other places where your cement must withstand the deteriorating action of corrosive elements.

Robinson UNIFORM Refractories: Silica Brick, Fire Brick, High-Temperature Bonding Mortars, Castable Refractories, Super Duty and Standard Plastic Fire Brick, Acid-Proof Cement, Fire Clays.

R-149-31

Write for Robinson's new bulletin of Useful Refractories Data. It is yours for the asking! Just drop a line to The Robinson Clay Product Company, Akron 9, Ohio, for your free copy.

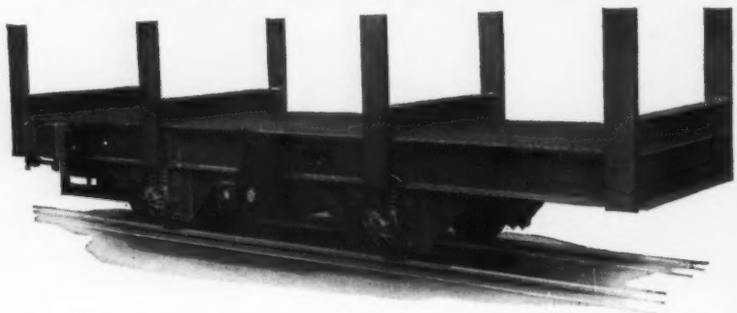
THE ROBINSON CLAY PRODUCT CO.
AKRON 9, OHIO

ATLAS

INTERPLANT HAULAGE EQUIPMENT

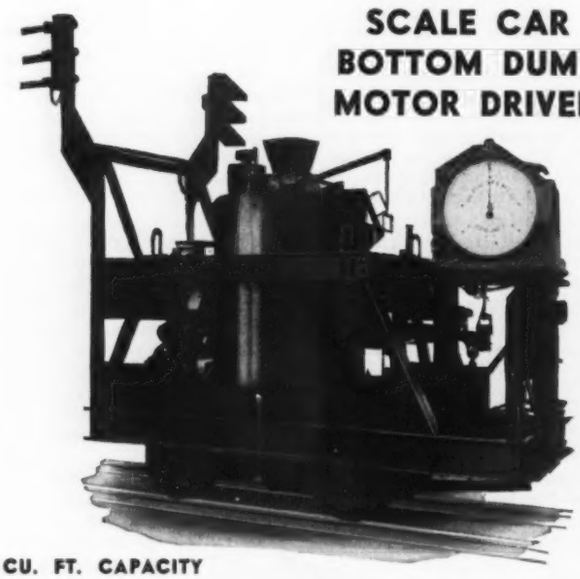
SPEEDS PRODUCTION

10 TON STORAGE BATTERY FLAT CAR



Built for handling pipe and conduit. Powered by storage battery. Geared to travel at walking speed when controller is held in operating position. Automatic "shut-off" and brake applied when spring return handle of the controller is released.

ELECTRIC SCALE CAR BOTTOM DUMP MOTOR DRIVEN



36 CU. FT. CAPACITY

For use in chemical plants. Cylindrical type body with dust filter. Mounted on Atlas Scale with 24" Atlas Dial and type-printing recorder. Car equipped with brakes, levers for operating discharge and loading chutes.

ATLAS ENGINEERING SERVICE
IS ALWAYS AT YOUR SERVICE

THE ATLAS CAR & MFG. CO.

ENGINEERS MANUFACTURERS

FREE PUBLICATIONS

Continued

current use. *Republic Steel Corp. For more information, check No.* 17 *on the postcard on p.* 37.

Speed Reducers

How standard single-reduction speed reducers may be combined to give double reduction units is described in bulletins No. 8962 and 8964. Specifications and data are included. *Cone Drive Div., Michigan Tool Co. For more information, check No.* 18 *on the postcard on p.* 37.

Impeller Pumps

Opposed impeller pumps operating at up to 1000 psi are featured in catalog 1550. Features, specification and engineering data are included. *DeLaval Steam Turbine Co. For more information, check No.* 19 *on the postcard on p.* 37.

Pipe Threader

Portable pipe threader that can thread 1 to 8 in. pipe without removal of piping installation is featured in 4-p folder. Various applications and instructions for use are included. *Muncie Gear Works, Inc. For more information, check No.* 20 *on the postcard on p.* 37.

Heavy Duty Presses

Heavy duty presses in the 50 to 800 ton capacity range are described in 16-p bulletin. Features and specifications are included. *Danly Machine Specialties, Inc. For more information, check No.* 21 *on the postcard on p.* 37.

Cast Wheels

Featured in bulletin are alloy cast steel mine car wheels. Dimensional drawing of mine car wheel is included. Alloy has been used for wheels in other industrial applications. *West Steel Casting Co. For more information, check No.* 22 *on the postcard on p.* 37.

Resume Your Reading on Page 37

EpCo WANTS YOU TO PROFIT

by our knowledge of the practical limits of

PRECISION INVESTMENT CASTING

EPCO PRECISION INVESTMENT CASTINGS in practically all metals, including the 12% chromium stainless irons, have been quietly winning new friends and keeping them by consistently meeting and exceeding the requirements asked of them.

We've been able to save pennies and even dollars for our customers on every casting we ship them. There's more than an even chance that we can do the same for you, if you are hogging the part out of the solid or bothered by special operations and cutters in finishing your forgings or sand castings.

And please keep in mind that the difference in cost between special purpose materials and carbon steels is usually negligible when you specify EPCO PRECISION INVESTMENT CASTINGS, thus giving you the advantage of greater freedom of design.

As for quantities, we've been cheerfully filling orders, whether for 30 pieces or 3,000, with equal ease and at a saving to our customers in either case.

If you find that the "front office" is keeping a critical eye on tooling costs, you'll be pleasantly surprised to know that the cost of tooling for EPCO PRECISION INVESTMENT CASTINGS is often far less than the cost of building milling and drilling fixtures required for machining the same part from bar stock.

FORGE-CASTINGS*

Metallurgists who are keeping up with the most recent developments in high temperature alloys, particularly in their jet engine applications, may be interested to know that EPCO is casting these alloys to rigidly controlled grain size specifications.

* EPCO controlled grain size investment castings.

"SUPER" ALLOYS

Besides investment castings, EPCO is also supplying special high-strength-at-high-temperature alloys in the form of cast bars for research purposes and for use in machine parts subject to severe corrosive action or high temperatures. These alloys can be machined with high speed tools on standard tool-room equipment.

For Further Information Please Write for Pamphlet
"EPCO PRECISION INVESTMENT CASTINGS"

ENGINEERED PRECISION CASTING CO.

BOX 253, IA MATAWAN, N. J.

New England Representative
Hawkridge Brothers Co., 303 Congress St., Boston, Mass.

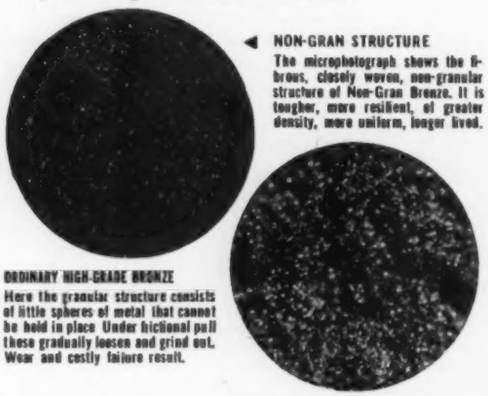
better than an aspirin . . .

NON-GRAN BRONZE

***the metal that wears* IN *while others wear* OUT**

Headaches vanished for the maker of a water filter pump who experienced trouble with steel cams, thanks to Non-Gran. The replacement of these parts was necessary within each 12 month period. Corrosion being coupled with wear. We corrected the trouble by casting the cams of Non-Gran Bronze so nearly to size that only a file-fit was necessary. Costly machining was eliminated. Service life extended indefinitely. Rust licked!

We welcome your request to help with any problem concerning bronze casting or the machining of parts in any metal to aircraft tolerances. We have worked with manufacturers in diversified fields for 40 years. Request detailed literature.



NON-GRAN STRUCTURE
The microphotograph shows the fibrous, closely woven, non-granular structure of Non-Gran Bronze. It is tougher, more resilient, of greater density, more uniform, longer lived.

ORDINARY HIGH-GRADE BRONZE
Here the granular structure consists of little spheres of metal that cannot be held in place. Under frictional pull these gradually loosen and grind out. Wear and costly failure result.

Booth #2819 Cleveland Metal Show

PHYSICAL CHARACTERISTICS OF NON-GRAN BRONZE

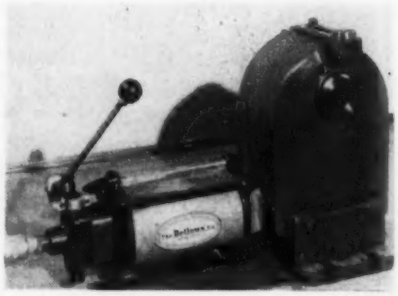
Ultimate Tensile	40,000 psi
Yield Point	22,000 psi
Proportional Limit	11,500 psi
Elongation in 2 in.	15%
Reduction of area	11%
Modulus of Elasticity	13,000,000
Ultimate Compression	50,000 psi
Ultimate Shear	45,000 psi
Linear coefficient of thermal expansion	.000011
Brinell Hardness (10 mm ball, 500 KG load, thirty seconds)	80

American NON-GRAN Bronze Company
BRONZE CASTINGS • PRECISION MACHINE WORK
108 LANCASTER AVE., BERWYN 8, PA.
Metropolitan Philadelphia

NEW

PRODUCTION IDEAS

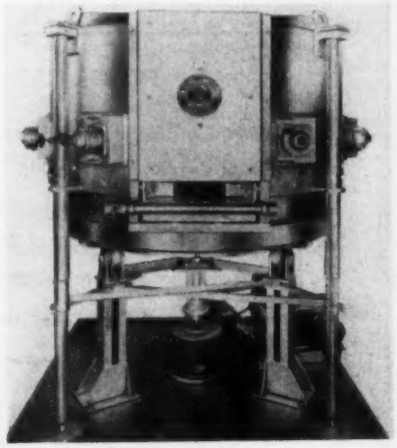
Continued from p. 40



manually operated valve or with the Bellows electrically controlled air-powered-valve. *Bellows Co. For more information, check No. 33 on the postcard on p. 37.*

Forge Furnace

A portable rotary hearth forge furnace is designed to assure a steady supply of clean forgings, uniformly heated, ready for the forging hammer. Controlled atmosphere produces a light scale that will flake off easily with the first blow of the hammer. This is accomplished by gas burners that



permit a slight amount of fuel oil to be introduced into the furnace atmosphere during heating. The furnace produces up to 900 lb forgings per hr, heated to 2100°F. Working hearth is 4 ft diam and work is charged and discharged onto the rotating table through a single slot 9 in. wide x 2½ in. high.

We give every fastening problem these 100 years of study

Since 1849, Blake & Johnson has been serving industry with successful solutions to fastening problems. That century of experience is yours to command today . . . whatever your problem . . . whatever your product. Our engineers are always glad to work with yours to help select or develop the fastening that provides quickest application, greatest holding power and soundest economy for your particular needs. Call on us.

When you specify Blake & Johnson fastenings—whether machine screw nuts or special threaded fasteners—you know there's a century of know-how behind them.

BLAKE & JOHNSON *Fastenings*

Slotted or Phillips head machine screws, wood screws, stove bolts, tapping screws, special headed products; nuts, rivets, chaplets, wire forms, screw machine products . . . in steel, stainless steel, copper, brass, bronze, everdur, nickel, nickel silver, monel, aluminum . . .

1849—1949

A CENTURY OF MANUFACTURING FASTENINGS FOR ALL INDUSTRY

THE BLAKE & JOHNSON COMPANY
WATERVILLE 14, CONNECTICUT

Please send me your new catalog containing full data on the complete line of Blake & Johnson fastenings.

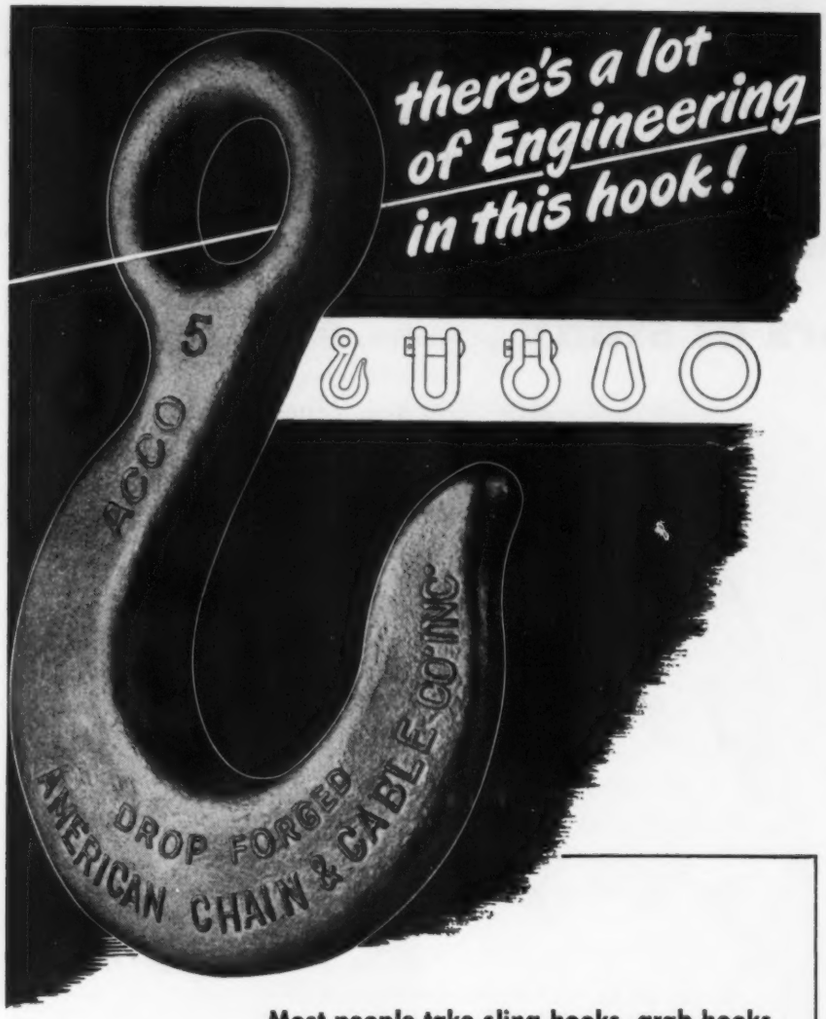
NAME

TITLE

COMPANY

ADDRESS

A-4



Most people take sling hooks, grab hooks, shackles—chain fittings of one kind or another—pretty much for granted . . .

Here at American Chain we take them seriously. Their design and manufacture call for a high type of engineering, plus years of experience.

The designers, metallurgists and other engineers responsible for the quality of American Chain products are proud of the results of their work. To them every American Chain fitting must be designed to do a job and do it well—made for safety as well as efficiency.

When you think of welded or weldless chain or chain fittings, think of AMERICAN—*"the Nation's chain maker."*
When you buy chain, buy AMERICAN,
the *complete* chain line.

AMERICAN CHAIN

York, Pa., Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Bridgeport, Conn.

ACCO

AMERICAN CHAIN DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

In Business for Your Safety

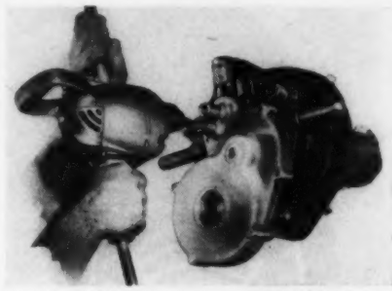
PRODUCTION IDEAS

Continued

The furnace shell is steel plate lined with 4½ in. fire brick and 4½ in. of insulation. Heating time is from 12 to 36 min. *W. S. Rockwell Co. For more information, check No. 34 on the postcard on p. 37.*

Portable Pipe Threader

One man operating a new portable pipe threader can thread up to 6-in. pipe in any position, horizontal, vertical or on an angle. Porta-



Drive, a 20:1 gear reduction unit, is driven by any ½ hp heavy-duty electric drill and attaches to any standard set of dies by special adaptor-yokes. An aluminum casing houses a bull gear and cold rolled spur gears sealed in grease. After threading is completed, insertion of the drill head into a reverse drive socket allows quick removal of the die. *Muncie Gear Works, Inc. For more information, check No. 35 on the postcard on p. 37.*

Tool Holder

Reduction in tool breakage is claimed for a tool holder with a new locking method that eliminates

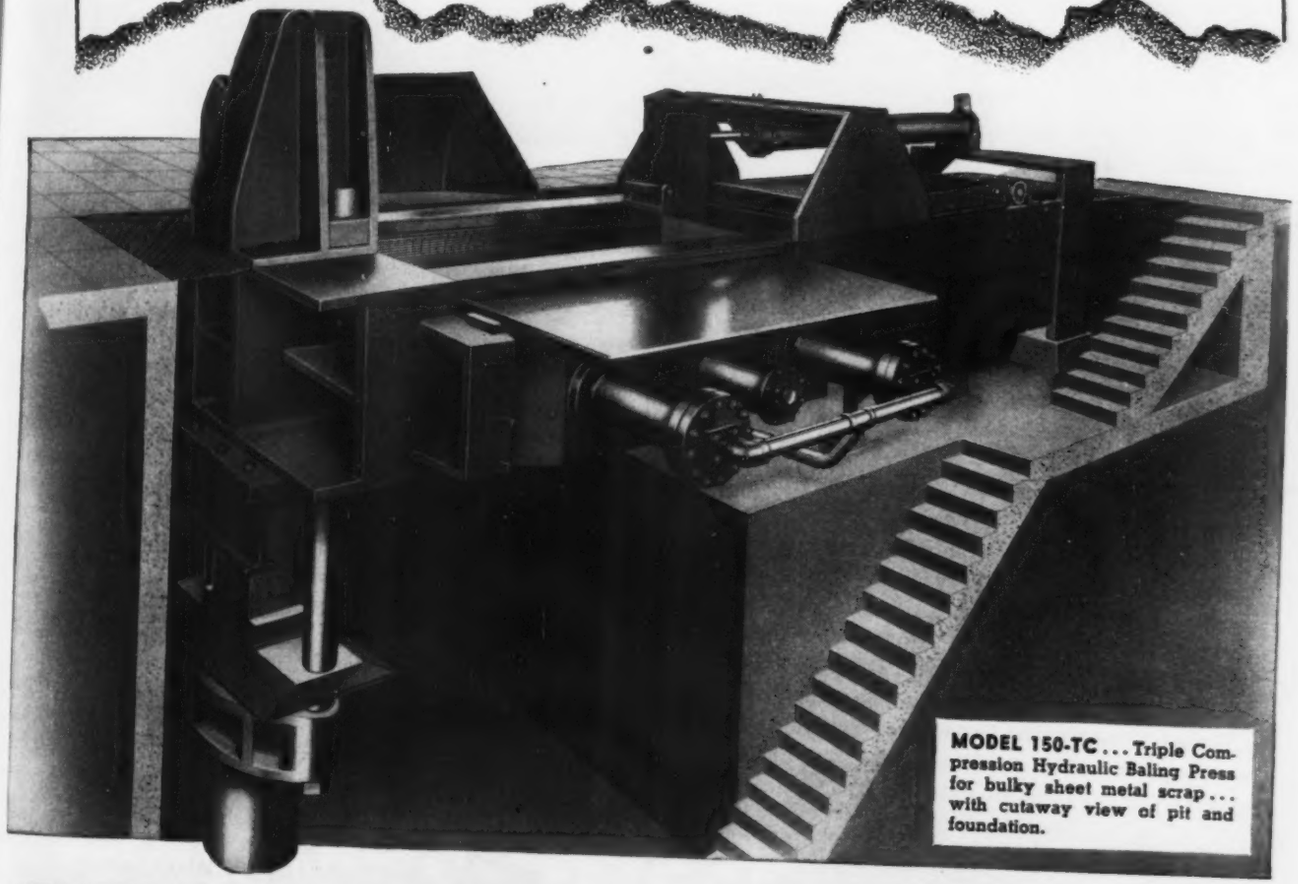
bit vibration. The Redy Rigid tool holder clamps the carbide bit against the work surface with maximum rigidity by a lock block, screw, and lock nut arrangement. Production is said to be two and

INTEGRATE YOUR PLANT
by BALING your Sheet Metal Scrap

A well organized metal working plant which generates a volume of sheet metal stampings or clippings should include equipment for processing such scrap into compact bales of correct size and density for remelting. As such, it becomes valuable "raw material" in the production of new metal — sheets, strip, bars and ingots — and contributes to the conservation of natural resources.

A powerful hydraulic baling press . . . carefully engineered and ruggedly constructed . . . is essential to the orderly low-cost baling of your sheet metal scrap. Galland-Henning builds such balers in a range of sizes and capacities for every industrial need, and offers you competent, experienced counsel toward establishing an efficient, profitable baling operation in your plant. Write —

GALLAND-HENNING MFG. CO.
2747 SOUTH 31ST STREET • MILWAUKEE 7, WISCONSIN



MODEL 150-TC . . . Triple Compression Hydraulic Baling Press for bulky sheet metal scrap . . . with cutaway view of pit and foundation.

GALLAND-HENNING
SCRAP METAL BALING PRESSES

Sawmill, logging, excavating, grading . . . a lot of equipment went into the making of this house. And to keep that equipment on the job . . . to maintain the pace of the nation-wide appeal for more housing . . . a lot of trained service specialists worked day and night bending their special skills to a public need.

Most of the heavy machinery used in building this home was Twin Disc-equipped, from the logging show to the surfacing of the driveway. Trained service representatives from Twin Disc's convenient repair parts stations and factory branches helped keep this heavy-duty equipment in top working condition . . . held "downtime" to a minimum by keeping replacement parts in stock.

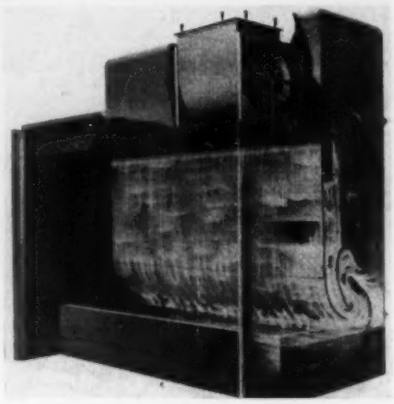
So why not have these Twin Disc specialists check your power transmission units for wear and adjustment. Their recommendations may save you costly emergency repairs later. They can completely rebuild your old unit, or supply you with new Twin Disc Clutches and Hydraulic Drives. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).

SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

three times greater before regrinding. Only one brazing is needed to an entire bit, and adjustment or changing of the bit is possible without disturbing the holder. The tool holder is available for round, square, rectangular and triangular bits of all standard sizes. *American Die & Tool Co. For more information, check No.* 36 *on the postcard on p.* 37.

Paint Spray Booth

A new paint spray booth, called the Roto-Wash, provides suction of paint laden air at both the top and bottom of the water curtain, creating an even flow of air across the face of the booth. This traps the maximum amount of paint overspray in the spraying area, and permits a prewash of the air before it enters the washing section of the booth. Washing action is created by suction from the exhaust fan. As the spray-charged air stream passes through the Roto-Wash, its direction is reversed twice as it impinges against metal baffles, resulting in a thorough scrubbing action. Paint laden water settles as sludge in the tank below. The booth is pre-assembled and factory tested. *Newcomb-Detroit Co. For more information, check No.* 37 *on the postcard on p.* 37.



Miniature Lubricator

The new miniature One-Shot lubricator has been designed for sump mounting. It has a wide field of application where closely controlled but infrequent oil feed

HERE'S YOUR ANSWER

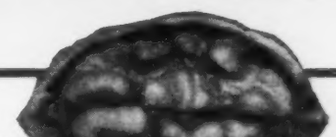
to faster, better, uniform, low-cost blast cleaning

IN A NUTSHELL

That's a broad claim. We don't expect you to accept it without substantiation. We hope you will ask us to present our proof. All we ask, is that you let it be on-*your*-job proof. Proof we know you'll believe! The only proof we want you to accept.

Like many production finishing men, perhaps you have always taken shot and grit pretty much for granted. If so, you have a surprise coming, for Hi-Grade Shot and Grit IS different—so superior, in so many ways—you can only appreciate its true value by job-testing the material yourself. That way you get proof of performance you can accept as conclusive. Order a trial quantity today. We'll let results speak for themselves. You'll find they say, "*Hi-Grade is best by test*"—your answer to faster, better, uniform, low-cost blast cleaning, in a nutshell.

Packed in 100 lb. Bags—Ready For Immediate Shipment



YOU GET TO THE HEART OF HARD-TO-CRACK BLAST CLEANING PROBLEMS FASTER WITH

HI-GRADE SHOT AND GRIT

- **YOU GET MORE EFFICIENT PEENING AND CLEANING.** Hi-Grade Shot and Grit is uniform, especially processed to withstand repeated strain, stress and wear.
- **YOU GET MORE FOR YOUR BLAST CLEANING DOLLAR—LESS WASTE.** Hi-Grade Shot is famous for its lack of hollows, tails and irregular shapes which do no good, yet cost money. Hi-Grade Grit is free from dust fines and scale. This alone, saves you up to 20% in actual cost *before you even use Hi-Grade Shot and Grit.*
- **YOU GET A LOWERED COST PER TON OF CASTINGS CLEANED** because Hi-Grade Shot and Grit has a longer re-use value. Special alloying and tempering process minimizes impact fractures.

HI-GRADE SHOT AND GRIT MORE THAN MEETS S.A.E. SPECIFICATIONS—SCREENED AND GRADED FOR 100% USAGE

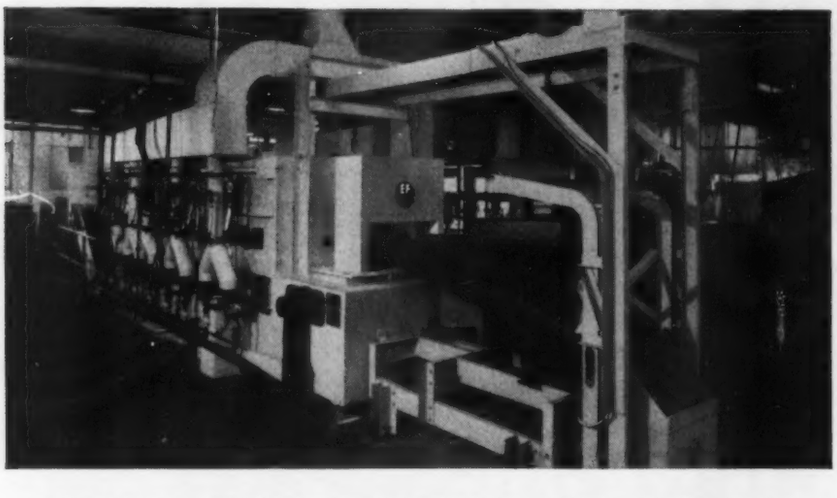
Clayton-Sherman *Abrasives Company*

MANUFACTURERS OF *QUALITY-CONTROLLED* SHOT AND GRIT

Representatives in Principal Cities

3896 LONYO ROAD ★ DETROIT 10, MICHIGAN

LOW COST



HEAT TREATMENT OF SMALL

AND MEDIUM SIZE PARTS

● The EF chain belt conveyor furnace — with its specially designed heat resistant cast link conveyor belt — is one of the most satisfactory continuous heat treating units yet devised for the scale-free hardening, carbon restoration and non-decarb heat treatment of bolts, chains, gears, pinions, rivets, tools, tractor treads and a wide variety of other forged, drawn, stamped, machine and headed pieces.

Built in 11 standard sizes with capacities up to 2,000 lbs. per hour. Larger sizes to meet any requirement. Gas-fired, oil-fired or electrically heated, whichever best suits your particular requirement — and location. Estimates of equipment, installation and operating costs — and samples of heat treated parts furnished promptly. Write for literature.

EF

THE ELECTRIC FURNACE CO.

GAS FIRED, OIL FIRED AND ELECTRIC FURNACES FOR ANY PROCESS, PRODUCT OR PRODUCTION

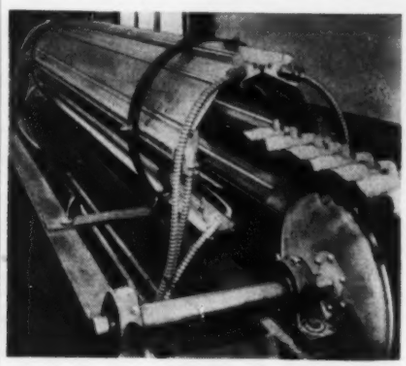
Salem - Ohio

meets the operating requirements of a machine. The lubricator is a piston-type unit with a filter that prevents foreign particles being drawn into the distribution system.

Action is initiated by withdrawing a pull button upon release of which the delivery of a measured quantity of filtered oil to all bearings is carried out automatically. The lubricator may be mounted in any location and adaptable to any machine layout. *Bijur Lubricating Corp. For more information, check No.* 38 *on the postcard on p.* 37.

Core Drying Oven

A full day's production capacity of wash-dipped sand cores can be turned out in 3 hr with a new electric infra-red oven. The oven consists of six all-metal Chromalox



radiant heaters mounted at angles to form a circular drying tunnel, the temperature being regulated by a variable input controller. Baked cores are dipped in a wash solution to provide a smoother finished

GET 2 to 25 TIMES LONGER LIFE

with one of these 9 HAYNES hard-facing alloys

Protect metal parts from wear the economical way—by hard-facing them with a HAYNES alloy. These brief descriptions will help you select the right one for your wear problem.

HAYNES hard-facing alloys are easy to apply by all welding methods:

OXY-ACETYLENE

Smooth sound deposits can be made by both manual and automatic methods with HAYNES bare rods.

METALLIC ARC

Flux-coated rods, available in practically all grades, provide a steady, quiet arc

"HELIARC" WELDING

This new process provides another fast method for depositing HAYNES bare rods.

HAYNES STELLITE Cobalt-Base Alloys

HAYNES STELLITE Alloy Grade 1: The hardest of the cobalt-base alloys recommended for coating surfaces subjected to extreme abrasive wear and slight impact. It is especially useful for resisting heat or corrosion combined with abrasion.

HAYNES STELLITE Alloy Grade 6: The toughest and strongest of the cobalt-base alloys. Recommended for coating surfaces subjected to mechanical or thermal shock. Produces sound deposits that will not check or crack.

HAYNES STELLITE Alloy Grade 12: A hard, wear-resistant alloy that is tough enough to withstand shock and impact. Recommended for coating large areas where deposits free from checks or cracks are required.

HAYNES Iron-Base Alloys

HAYNES Alloy 90: Highly wear-resistant. Resists oxidation and retains much of its original hardness at temperatures up to 1,000 deg. F. Withstands moderate impact.

HAYNES Alloy 92: A moderately low melting point rod. Use it on thin sections where low-temperature deposition is necessary to prevent distortion and on large parts when preheating is difficult or impossible. Deposits have a hardness of Rockwell C 65.

HAYNES Alloy 93: Gives excellent service where high cold-hardness is necessary. It is suitable for applications involving abrasion from sand, gravel, mill scale, or other hard particles.

HASCROME Rod: A work-hardening rod, recommended for use under conditions of severe impact. It is widely used for hard-facing rock and earth handling equipment parts. Recommended for electric application to manganese steel.

HAYNES Tungsten-Base Alloys

HAYSTELLITE Cast Tungsten Carbide: The hardest of all HAYNES hard-facing alloys, used where utmost resistance to abrasion is required. Typical applications include oil-well drilling tools, ditcher teeth, and coal undercutter bits.

HAYNES Nickel-Base Alloys

HASTELLOY Alloy C: Recommended for building up wearing surfaces of hot-working steel mill parts such as hot shear blades, entry guides, and shafts.

HAYNES TRADE-MARK *alloys*

The trade-marks, "Haynes," "Haynes Stellite," "Hascrome," "Haystellite," "Hastelloy," and "Heliarc" distinguish products of Union Carbide and Carbon Corporation and its Units.

Haynes Stellite Company

Unit of Union Carbide and Carbon Corporation

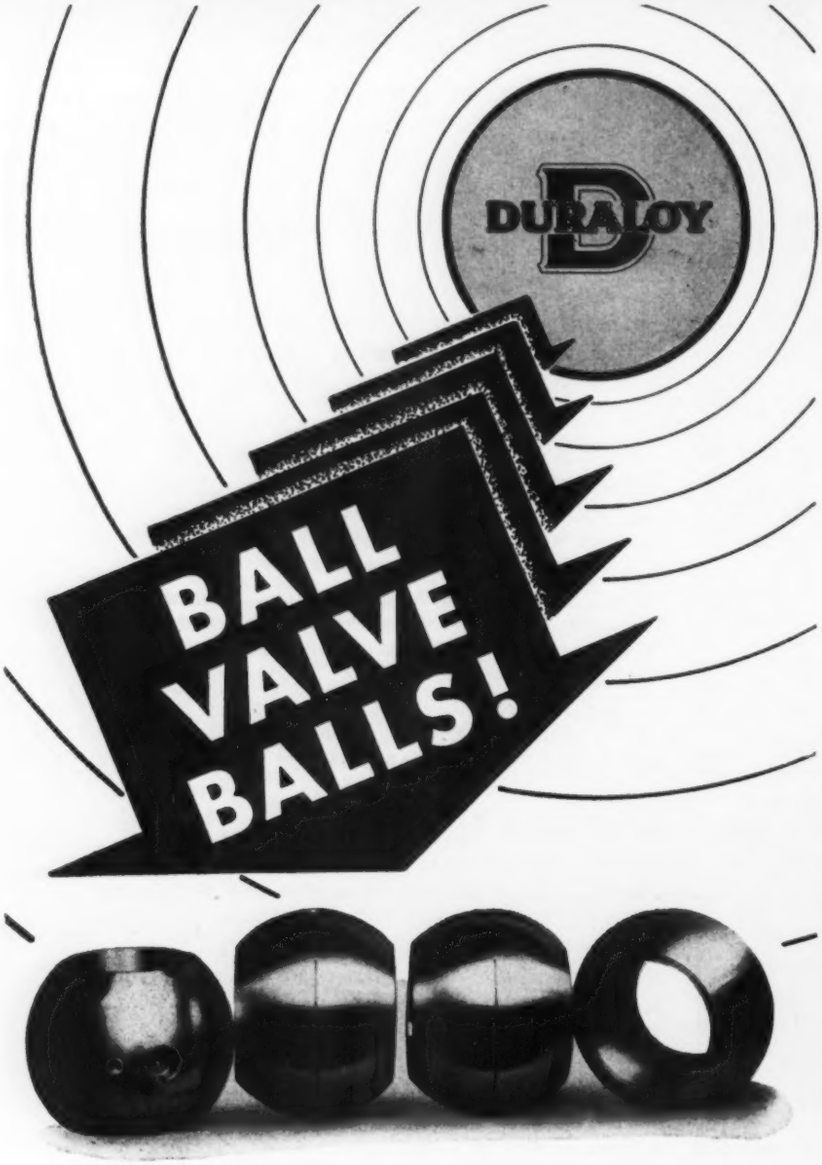
UCC

General Offices and Works, Kokomo, Indiana

Sales Offices

Chicago — Cleveland — Detroit — Houston

Los Angeles — New York — San Francisco — Tulsa



These are 12% chrome-iron, cast statically. They're machined and finished to close tolerances.

Producing chrome-iron, chrome-nickel and nickel-chrome static castings has been our business exclusively since 1922. We helped pioneer this phase of the high alloy casting business just as we helped pioneer centrifugal castings beginning in 1931.

At Scottdale, we have one of the most modern high alloy foundries in the country. We have exceptional technical controls and a 400,000 volt X-ray machine. We can produce individual static castings up to 7½ tons in weight and machine or otherwise finish them to specifications.

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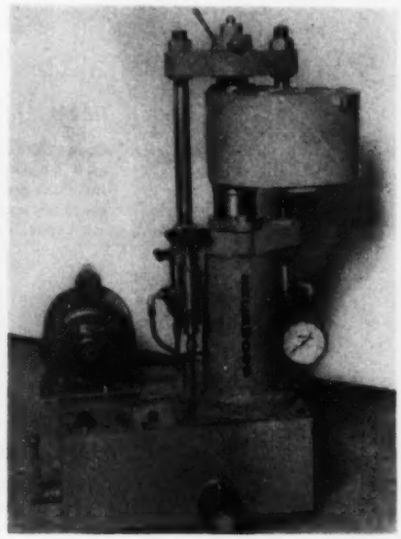
surface and to coat exposed core wires. Breakage is minimized as cores are dry in approximately 2 min after dipping. Accurate temperature control prevents burning or under-baking. The oven heats to operating temperature in 2 min. *Edwin L. Wiegand Co. For more information, check No.* 39 *on the postcard on p.* 37.

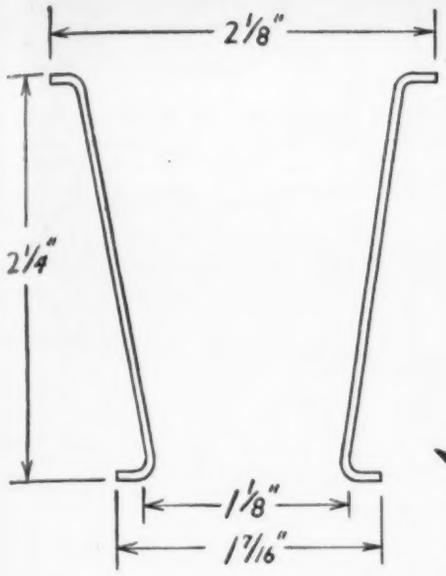
Wax Injection Press

Volume production of wax patterns for industrial precision castings is possible on the new Sherwood wax injection press. Wax is extruded by direct piston drive ac-

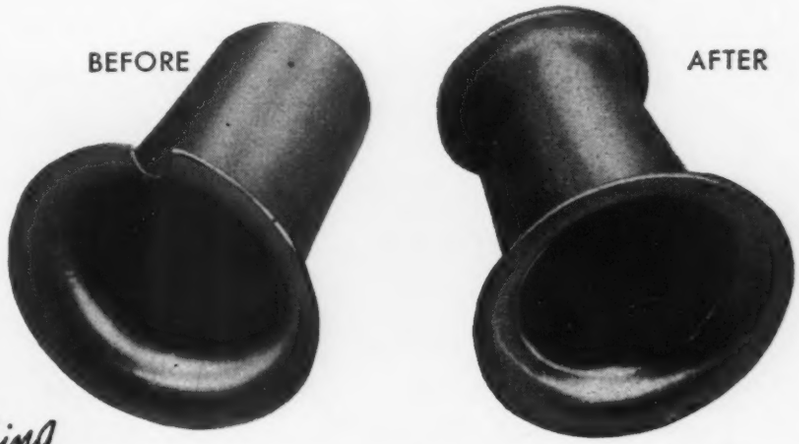


tivated by a hydraulic pump, with wax pressures varying from 100 to 1500 psi. The wax is contained in cylinders carried in a revolving drum. While being discharged from one cylinder, wax in the other cylinders is being tempered by electric strip heaters. Temperatures are thermostatically concontrolled within ±2°F. Each wax chamber has a 78 cu in. capacity. Discharge nozzles can be arranged for upward or horizontal injection. For low pressure work the die may be held manually against the nozzle. Power source consists of an electric motor and V-belt drive operating a hydraulic pump. *Alexander Saunders & Co. For more information, check No.* 40 *on the postcard on p.* 37.

Resume Your Reading on Page 41



First they tried two makes of Type 304 Stainless Tubing, and got 50% rejects on the job.



Then they changed to Carpenter Stainless Tubing (Type 304) and eliminated the high cost of rejects and making more parts than were ordered.

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METAL SHOW PROGRAM

Continued from Page 79

L. Reed and H. C. Mann, Watertown Arsenal Laboratories. AIME.

Stress and Strain States in Elliptical Bulges, by C. C. Chow, A. W. Dana and G. Sachs, Case Institute of Technology. AIME.

Comparative Creep Properties of Several Types of Commercial Coppers, by A. D. Schwope, K. F. Smith and L. R. Jackson, Battelle Memorial Institute. AIME.

Active Slip Systems in the Simple Axial Extension of a Single Crystalline Alpha Brass, by R. C. Maddin, C. H. Mathewson and W. R. Hibbard, Jr., Yale University. AIME.

ELECTRICAL PROPERTIES OF ALLOYS

P-Type and N-Type Silicon and the Formation of the Photovoltaic Barrier in Silicon Ingots, by J. H. Scaff, H. C. Theurer and E. E. Schumacher, Bell Telephone Laboratories. AIME.

Microstructure of Silicon Ingots, by W. G. Pfann and J. H. Scaff, Bell Telephone Laboratories. AIME.

Electrical Properties of the Intermetallic Compounds Mg_2Sn and Mg_2Pb, by W. D. Robertson, University of Chicago and H. H. Uhlig, Mass. Institute of Technology. AIME.

Ferromagnetic Alloys in the Systems Copper - Manganese - Indium and Copper-Manganese-Gallium, by F. A. Hames and D. S. Eppelsheimer, Missouri School of Mines and Metallurgy. AIME.

ALLOY STEELS

Effect of Boron and Kind of Boron Addition Upon the Properties of Steel, by R. A. Grange and W. B. Seens, U. S. Steel corp. Research Laboratory, and W. S. Holt and T. M. Garvey, Carnegie-Illinois Steel Corp. ASM.

Characteristics and Properties of Cast Low-Chromium-Molybdenum Steels, by N. A. Ziegler, W. L. Meinhart, and J. R. Goldsmith, Crane Co. ASM.

Iron Manganese and Iron-Manganese Nickel Alloys, by I. R. Kramer, Office of Naval Research, S. L. Toleman, Naval Research Laboratory, and W. T. Haswell, Latrobe Steel Co. ASM.

Metallurgical Factors Affecting the Magnetic and Mechanical Properties of Iron-Cobalt Alloys, by J. K. Stanley, Westinghouse Electric Corp. ASM.

NONFERROUS METALS

Arc Welding of Molybdenum, by I. S. Goodman, Westinghouse Electric Corp. AWS.

Welding of High-Nickel Alloys to

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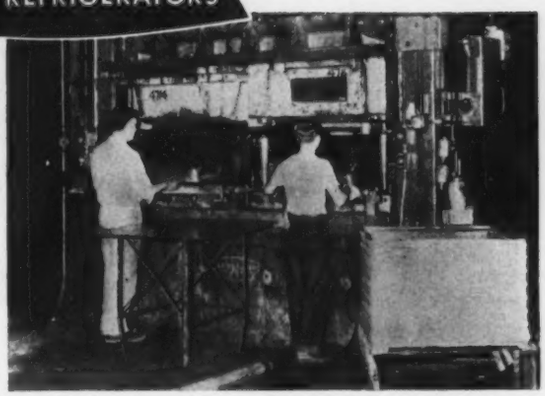

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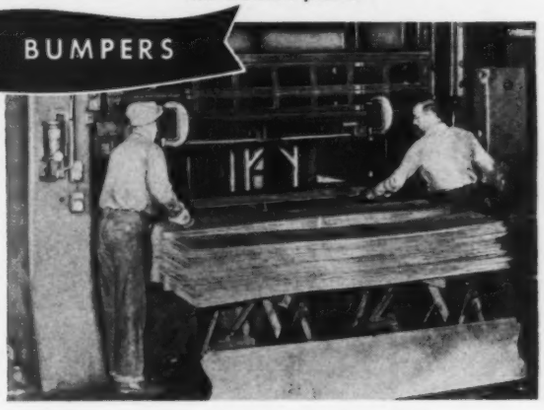

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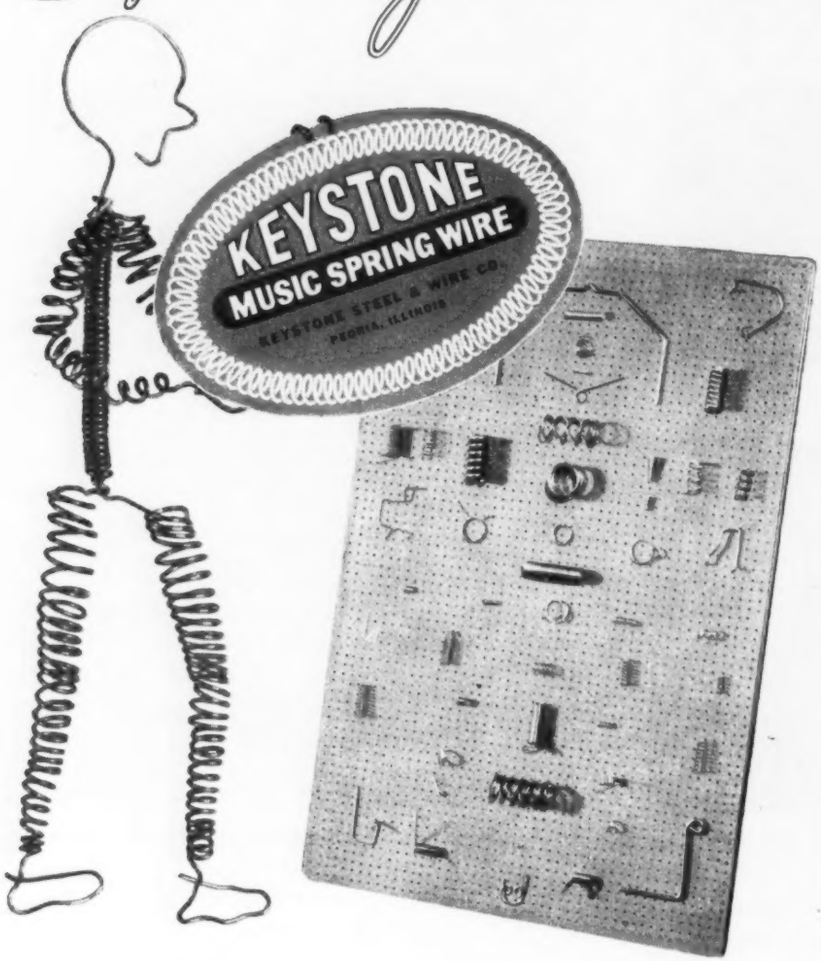

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METAL SHOW PROGRAM

Continued

Other Metals, by G. R. Pease and H. B. Bott, International Nickel Co. AWS.

Seam Welding Monel Metal to Steel, by E. F. Nippes, A. R. Pfluger and G. M. Slaughter, Rensselaer Polytechnic Institute. AWS.

EDUCATION

Welding in Engineering Education, by R. S. Green, Ohio State University. AWS.

Formal Training of Welding Personnel, by A. C. Tyler, LeTourneau Technical Institute. AWS.

Continuation of Study of Welding and Welding Processes, by F. W. Scott, Marquette Mfg. Co., Inc. AWS.

RESEARCH

Statistical Part in Welding Investigations, by B. B. Day, U. S. Naval Engrg. Exp. Station. AWS.

Brittle Failure and Size Effect in a Mild Steel, by K. J. Stodden and E. P. Klier, Pennsylvania State College. AWS.

Weld-Peening Investigations, by J. Lyell Wilson, American Bureau of Shipping. AWS.

8:00 P.M.

AWARDS OF PRIZES AND MEDALS, 1949 ADAMS LECTURE

Advantages and Disadvantages of Electric Welding as a Means of Fabricating Steel Structures, by W. M. Wilson, University of Illinois. AWS.

Tuesday, October 18

9:00 A.M.

TRANSFORMATIONS

Kinetics of Austenite Decomposition—Ferrite Nucleated Products, by J. C. Fisher, J. H. Holomon and D. Turnbull, General Electric Co. AIME.

Free Energy Changes Accompanying the Martensite Transformation in Steels, by J. C. Fisher, General Electric Co. AIME.

Hardenability Effect of Molybdenum, by J. M. Hodge, J. L. Giove and R. G. Storm, Carnegie-Illinois Steel Corp. AIME.

FRACTURE AND STRAIN PHENOMENA

Simultaneous Aging and Deformation in Metals, by J. D. Lubahn, General Electric Co. AIME.

Transverse Bending of Single Crystals of Aluminum, by M. K. Yen, New York University and W. R. Hibbard, Jr., Yale University. AIME.

Stages in the Deformation of Monel as Shown by Polarized Light, by D.

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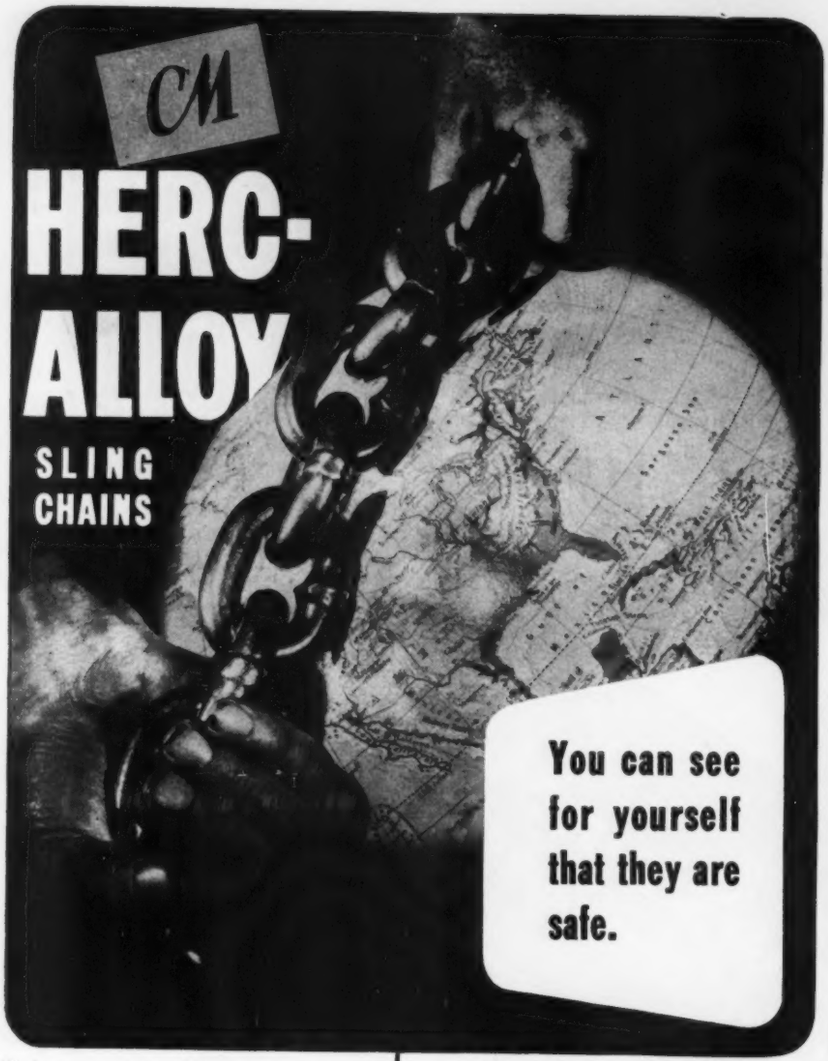

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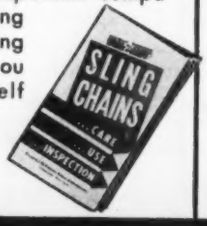

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METAL SHOW PROGRAM

Continued

H. Woodard, National Bureau of Standards. AIME.

Influence of Temperature on the Stress-Strain Energy Relationship for Copper and Nickel-Copper Alloys, by D. J. McAdams, Jr., National Bureau of Standards. AIME.

SURFACE ORIENTATION—PHASE RELATIONSHIPS

Surface Orientation and Rolling of Magnesium Sheets, by R. L. Dietrich, Dow Chemical Co. AIME.

Oriented Arrangements of Thin Aluminum Films on Ionic Substrates, by T. Rhodin, Jr., University of Chicago. AIME.

Kinetics of the Reactions of Zirconium with O_2, N_2 and H_2, by E. S. Gulbransen and K. Andrew, Westinghouse Research Laboratory. AIME.

Kinetics of the Reactions of Titanium with O_2, N_2 and H_2, by E. A. Gulbransen and K. Andrew, Westinghouse Research Laboratory. AIME.

9:30 A.M.

OXIDATION

High Temperature Oxidation of Manganese, by R. S. Gurnick, Thompson Products, Inc., and W. M. Baldwin, Jr., Case Institute of Technology. ASM.

Determination of Oxygen in Metals by the Vacuum Fusion Method, by R. K. McGeary, J. K. Stanley, and T. D. Yensen, Westinghouse Research Laboratories. ASM.

Methods of Determining Vapor Pressure of Metals, by R. Speiser, and H. L. Johnston, Cryogenic Laboratory, Ohio State University. ASM.

An X-Ray Study of the Scale Formed Iron Between 400 and 700° C, by O. A. Tesche, University of the Witwatersrand, Johannesburg, S. Africa. ASM.

QUENCHING

Quench Cracking Susceptibility Test for Hollow Cylinder, by C. Wells, Carnegie Institute of Technology, C. F. Sawyer, Vanadium-Alloys Steel Co., I. Broverman, Los Alamos Scientific Lab., and R. F. Mehl, Carnegie Institute of Technology. ASM.

Engineering Analysis of the Problem of Quench Cracking in Steel, by C. Wells, Carnegie Institute of Technology and J. W. Spretnak, Ohio State University. ASM.

Pre-Bore Quench for Hollow Cylinders, by J. W. Spretnak, Ohio State University and C. C. Busby, Carnegie Institute of Technology. ASM.

Statistical Methods for Evaluating the Quality of Certain Wrought Steel Products, by E. G. Olds, and

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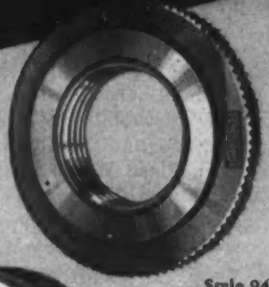
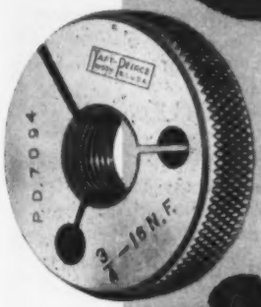
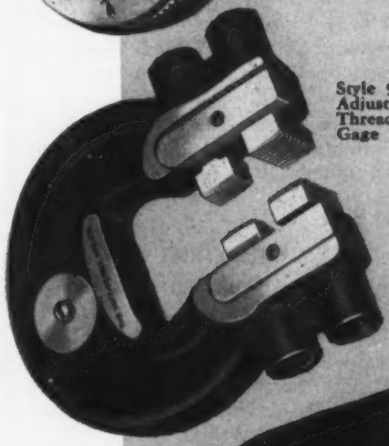
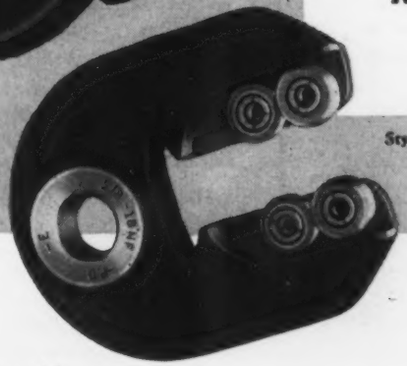

Style 9475—Pipe Ring Gage



Style 9424—Thread Ring Gage


Style 9432—Adjustable Thread Snap Gage


Style 9435—Johnsons Roll Thread Snap Gage

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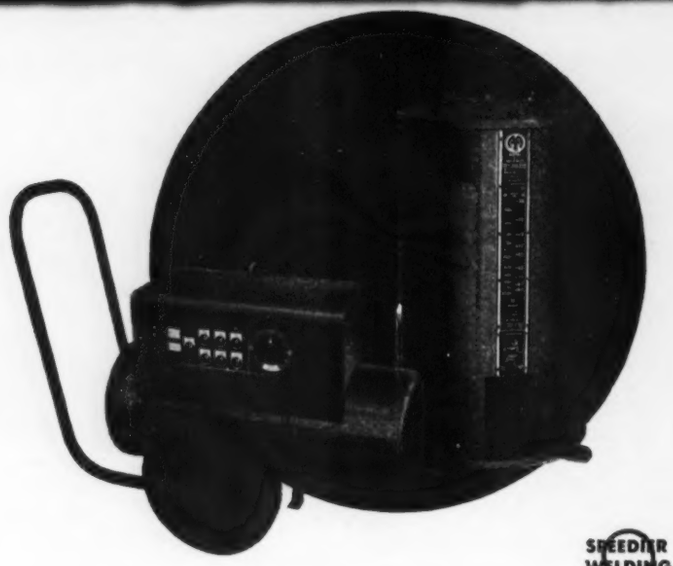

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METAL SHOW PROGRAM

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C. Wells, Carnegie Institute of Technology. ASM.

SYMPOSIUM ON SHIP STRUCTURE RESEARCH

The Work of the Ship Structure Committee, by Rear Admiral Ellis Reedhill, U. S. C. G., AWS.

Factors Influencing the Tensile Behavior of Notched Flat Plate Specimens, by S. T. Carpenter and Capt. W. P. Roop, USN (Ret.), Swarthmore College. AWS.

Correlation of Test Results, by C. F. Tipper, University of Cambridge, England. AWS.

Tests of Slotted Steel Plates, by E. M. MacCutcheon, C. L. Pittiglio, David Taylor Mode Basin, USN, and R. H. Raring, National Res. Council-AWS.

Further Study of the Navy Tear Test, by N. Kahn and E. Imbembo, N. Y. Naval Shipyard. AWS.

RESISTANCE WELDING

Material Consumption Rates and Flashing Characteristics, by W. N. Platte, Westinghouse Electric. AWS.

Factors Affecting the Quality of Production Flash Welding, by E. Sirabian, Arnold, Schwinn & Co. AWS.

Homopolar Generator Stored-Energy System for Resistance Welding. by T. J. Crawford, Progressive Welder Co. AWS.

Circuit Analysis of Frequency Changer Welders, by W. K. Boice, General Electric Co. AWS.

MACHINERY WELDING

Weldment Design and Engineering Practice, by A. K. Pandjiris, Pandjiris Weldment Co. AWS.

Welding of Alloy Steel Shovel Buckets, by E. R. McClung, Lukenweld. AWS.

Lowering Cost of Welded Construction, by O. Blodgett, Lincoln Electric Co. AWS.

Aluminum Bronze Electrodes, by J. A. Cunningham, J. A. Cunningham Equipment, Inc. AWS.

2:00 P.M.

TRANSFORMATIONS

Stable Transformation Nuclei in Solids, by J. N. Hobstetter, Harvard University. AIME.

Transformation in B-CuAl Alloys, by E. P. Klier, Penn State College and S. M. Grymko, Battelle Memorial Institute. AIME.

Transformation of Gamma Manganese to Alpha Manganese by E. V. Potter, H. C. Lukens and R. W. Huber, Bureau of Mines. AIME.

STRUCTURE AND IDENTITY OF MATERIALS

Rapid Determination of Orientation of Cubic Crystals, by C. Dunn and W. Martin, General Electric. AIME.

Crystal Structure of Ni$_4$W, by E.

Turn to Page 234

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METAL SHOW PROGRAM

Continued from Page 230

Epremian and D. Harker, General Electric Co. AIME.

Structure of Diborides of Titanium, Zirconium, Columbium, Tantalum and Vanadium, by J. T. Norton, Mass. Institute of Technology, H. Blumenthal and S. J. Sideband, American Electro Metallurgical Corp. AIME.

Isolation of Carbides from High Speed Steels, by D. J. Blickwede and M. Cohen, Mass. Institute of Technology. AIME.

DIFFUSION—GRAIN BOUNDARIES

Diffusion and Solubility of Carbon in Alpha Iron, by J. K. Stanley, Westinghouse Electric Corp. AIME.

Analysis of Interstitial Diffusion Using Activity Methods, by G. Guy, North Carolina State College. AIME.

Study of Grain Boundaries with the Electron Microscope, by J. F. Radavish, Purdue University. AIME.

Studies of Interface Energies in Some Aluminum and Copper Alloys, by K. K. Ikeuye and C. S. Smith, University of Chicago. AIME.

HIGH TEMPERATURE METALLURGY

Influence of Strain Rate and Temperature on the Creep of Cold-Drawn Ingot Iron, by W. D. Jenkins and T. G. Digges, National Bureau of Standards. ASM.

Stability of AISI Alloy Steels at Elevated Temperatures, by A. B. Wilder and J. O. Light, National Tube Co. ASM.

On the Extrapolation of Short Time Stress Rupture Data, by N. J. Grant and A. G. Bucklin, Mass. Institute of Technology. ASM.

Tungsten-Iridium Thermocouple for Very High Temperatures, by W. C. Troy and G. Steven, Armour Research Foundation. ASM.

SYMPOSIUM ON SHIP STRUCTURE RESEARCH

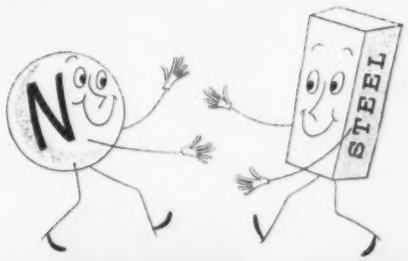
Distribution of Relative Ductility in Steel Weldments, by L. J. Klinger and L. J. Ebert, Case Institute of Technology, AWS.

Bend and Tensile Specimens Used as Indices of Performance and Weldability, by C. B. Voldrich and P. J. Rieppel, Battelle Memorial Institute. AWS.

Effect of Cyclic Stress on Impact Transition Curve of Ship Steels, by Prof. J. M. Lessells and H. E. Jacques, Mass. Institute of Technology. AWS.

Axial Tension Impact Tests of Structural Steels, by W. H. Bruckner

The ideal product for making nitrogen additions to steel:



Calcium Cyanamide 6-16

High In Nitrogen... High Decomposition Temperature... Not Hazardous... Low In Cost

Calcium Cyanamide 6-16 is ideal for making ladle additions to steel. This product contains 24 to 25% nitrogen, has high decomposition temperature, and assures you of a high nitrogen recovery. This product is free from dust and oil, and is packed in convenient size paper bags.

A literature search, which is included in our data sheet, reveals a number of desirable properties which can be imparted to steel by the use of nitrogen. The most important of which are:

- Greater stiffness
- Grain refinement
- Hardness and machinability
- Corrosion resistance
- Increased tensile strength
- Improved deep drawing properties
- High recovery of manganese
- Efficient removal of oxygen and sulphur

See us at the Cleveland Metal Show, Booth No. 1704, where representatives will be available for discussion of this product.

- FINER GRAIN STRUCTURE
- GREATER STIFFNESS
- GOOD MACHINING PROPERTIES
- BETTER CORROSION RESISTANCE
- INCREASED TENSILE STRENGTH

Write now for sample and technical data

1-10

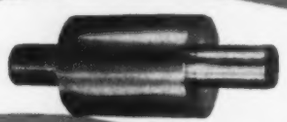
AMERICAN Cyanamid COMPANY

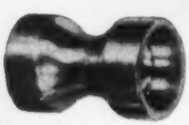
INDUSTRIAL CHEMICALS DIVISION
30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

☐ Send me a sample of Calcium Cyanamide 6-16
☐ Send me technical data sheet on Calcium Cyanamide 6-16 as a nitrogen additive for steel

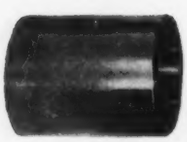
Name..... *Position*.....
Company.....
Address.....
City..... *State*.....

"ECONOMY in PRODUCTION"





IS EASY
TO ACHIEVE with
COAST METALS
HARD CAST ROLLS



LONGER EQUIPMENT LIFE . . .

Coast Metals Hard Cast Rolls will outwear and outlast iron or tool steel rolls as much as 15 : 1. Actual tests prove this.

FEWER SHUT-DOWNS . . . . . .

Coast Metals Hard Cast Rolls hold down-time and idle labor to a minimum. They give more uninterrupted production and tonnage.

UNIFORM FINISHED PRODUCT

Coast Metals Hard Cast Rolls give longer "runs" at closer tolerances. Mills report extended tonnage operations at higher speeds.

LOWER PRODUCTION COSTS

Coast Metals Hard Cast Rolls have produced 2319 tons as compared to 150 tons in actual tests with tool steel rolls. Performance 15 : 1. Cost reduction per ton 79 per cent.

PEAK EQUIPMENT OUTPUT . .

Coast Metals Hard Cast Rolls enable adjacent "parts" (rolls, bearings etc.) to operate at peak capacity longer and eliminate costly "slow-downs."

SEE THE COAST METALS EXHIBIT AT THE METAL SHOW
Booth No. 2329

COAST METALS
HARD CASTINGS,
HARD FACING WELD RODS

1232 CAMDEN AVENUE, S.W. CANTON 6, OHIO

METAL SHOW PROGRAM

Continued

and N. M. Newmark, University of Illinois. AWS.

RESISTANCE WELDING

Spotweld Consistency Studies, by Julius Heuschkel and H. C. Bitzer, Westinghouse Research Labs. AWS.

Spot Welding Heavy Gage Structural Steel, by E. F. Nippes and R. F. Underhill, Jr., Rensselaer Polytechnic Institute. AWS.

Slope Control and Its Effect on Spot and Projection Welding, by I. W. Johnson, General Electric Co. AWS.

MISCELLANEOUS

Welding of Zinc-Base Die Castings, by R. H. Ogden, Alladin Rod & Flux Mfg. Co. AWS.

Silver Alloy Brazing Stainless Steel, by C. H. Chatfield and A. W. Swift, Handy & Harman. AWS.

Magnaflux Inspection of Welded Storage Tanks, by F. A. Upson, Standard Oil Co. (Indiana). AWS.

High Energy Loading Method of Testing Steel Plate and Weldments, by G. S. Mikhalapov, Metallurgical Research and Development Co., Inc. AWS.

Wednesday, October 19

9:30 A.M.

APPARATUS

Design Features of a Welding Generator with Controlled Reactance, by J. M. Tyrner, Air Reduction Sales Co. and O. Kobel, G. D. Peters and Co. of Canada, Ltd. AWS.

Measurement of Flux Densities in Steels for Magnetic Particle Inspection, by T. E. Hamill, Naval Gun Factory. AWS.

Economical Arc Welding, by S. Oestreicher, Harnischfeger Corp. AWS.

RESISTANCE WELDING

Fatigue Tests of Spot-Welded Mild Steel and Stainless Steel Sheets, by Georges Welter, Ecole Polytechnique, Montreal. AWS.

Spot Welding Galvanized Steel, by M. L. Begeman, M. L. Hipple and L. Cullum, Jr., University of Texas. AWS.

Electrical Resistance Offered by Non-Uniform Current Flow, by W. B. Kouwenhoven and W. T. Sackett, Jr., Johns Hopkins University. AWS.

Design and Application of Portable Resistance Welding Tools, by C. H. Davis, Jr., The Budd Co. AWS.

ALUMINUM

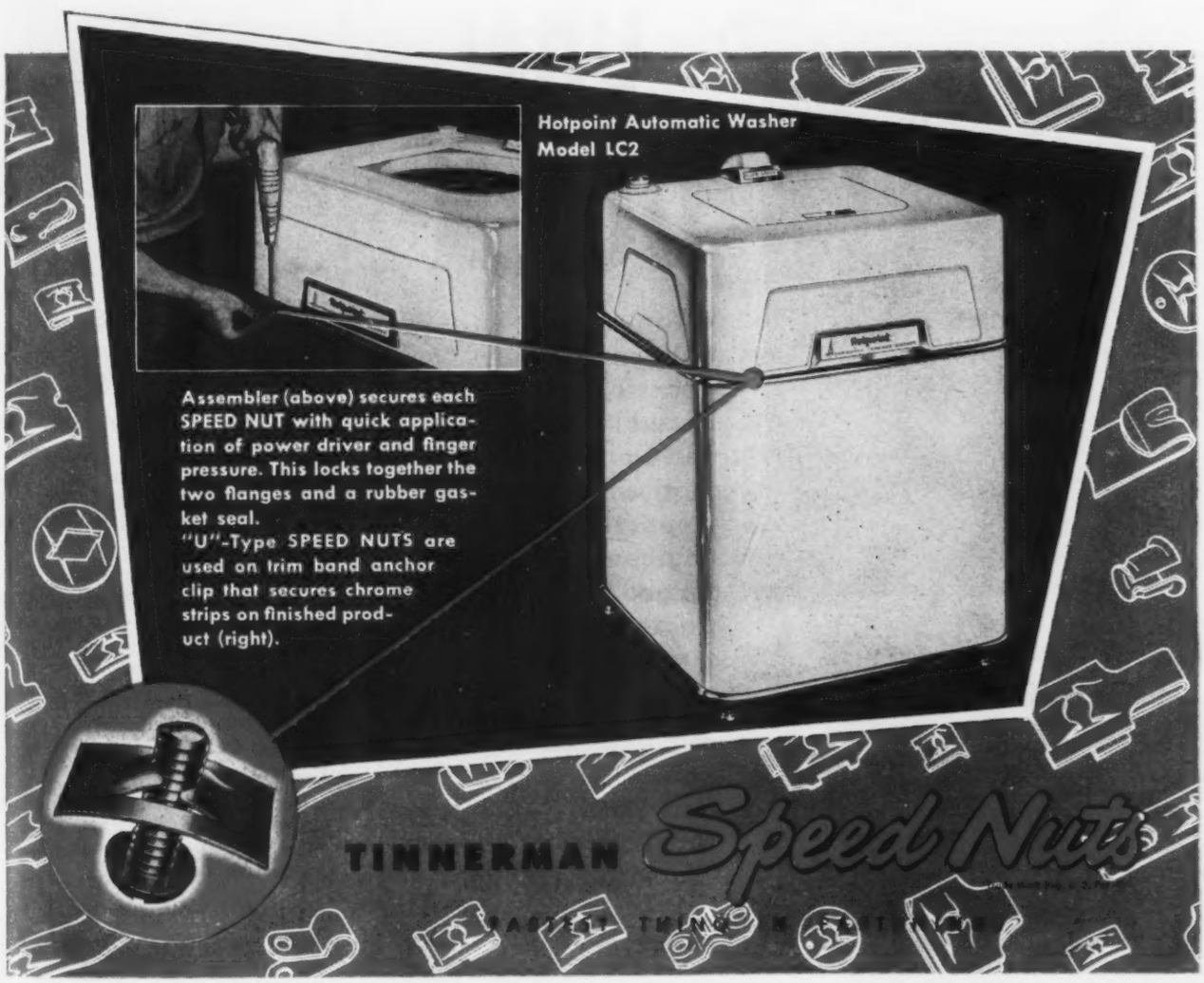
Economy of Shielded Arc Welding of Aluminum, by F. Albrecht, Glenn L. Martin Co. AWS.

Shear Strength Consistency of Spot Welds in Alclad 24 S-T3, by J. C.

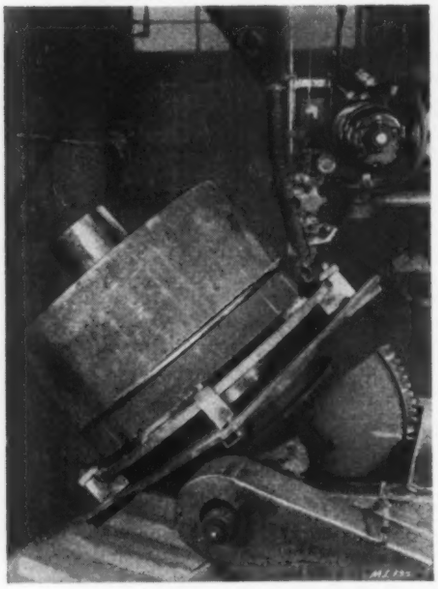
Hotpoint Switches to SPEED NUTS with Substantial Assembly Savings

Originally Hotpoint attached the lower section of its new automatic washer by means of a solid weld. Now we are using 12 Flat-Type SPEED NUTS to do the same job . . . *with a substantial saving.* The change also released welding equipment for other jobs and stepped up production by making a sub-assembly operation part of the final assembly, Hotpoint engineers report.

This is one of the many ways SPEED NUTS and SPEED CLIPS help Hotpoint keep costs down and production up. See for yourself the thousands of unique, cost-saving fastening applications performed by the SPEED NUT brand of fasteners. Your Tinnerman representative will call at your convenience. He's listed in major city phone directories. Or write: TINNERMAN PRODUCTS, INC., 2040 Fulton Road, Cleveland 13, Ohio. In Canada: Dominion Fasteners Limited, Hamilton.


Hotpoint Automatic Washer
Model LC2
Assembler (above) secures each SPEED NUT with quick application of power driver and finger pressure. This locks together the two flanges and a rubber gasket seal.
"U"-Type SPEED NUTS are used on trim band anchor clip that secures chrome strips on finished product (right).
TINNERMAN
Speed Nuts

"for Quality Weldments, call in VAN DORN"



• You can be sure of outstanding quality if your weldments are produced by Van Dorn. For Van Dorn has complete fabricating facilities . . . experienced design engineers . . . specially trained workmen . . .77 years' experience in metal working.

Consult us about your requirements—no obligation, of course. The Van Dorn Iron Works Co., 2685 East 79th St., Cleveland 4, Ohio.

Send For
FREE WELDMENT BOOK

Profusely illustrated; describes the many advantages of Weldments, and Van Dorn's extensive facilities.

Round Table Discussions To Study Production Economies

A series of panel discussions, sponsored by ASM, has been scheduled throughout the week, on the theme "Economy in Producton." These sessions will be held at the Public Auditorium at the following times and dates:

"Through Better Cleaning and Finishing Methods," Monday, October 17, 2:00 p.m.

"Through Improved Press Shop Operations," Monday, October 17, 8:00 p.m.

"Through Improved Welding Techniques and Equipment," Tuesday, October 18, 2:00 p.m.

"Through Improved Heat Treatment Operations," Tuesday, October 18, 8:00 p.m.

"Through Use of Tailor-Made Alloys or More Adaptable Mill Products," Wednesday, October 19, 2:00 p.m.

"Through Use of More Precise Castings or Formed Shapes," Wednesday, October 19, 8:00 p.m.

"Through Improved Metallurgy in Machine Shop Operations," Thursday, October 20, 2:00 p.m.

"Through Use of Brazing, Soldering and Welding for Subassemblies," Friday, October 21, 2:00 p.m.

Barrett, Glenn L. Martin Co. AWS.

Heliarc Welding of Aluminum Alloys, by F. H. Stevenson, Modern Metal Spinning & Mfg. Co. AWS.

NONDESTRUCTIVE TESTING TECHNIQUES

Radium, Tantalium and Cobalt as Sources of Radiation for Industrial Radiography, by G. H. Tenney, Los Alamos Scientific Laboratory. Non-Destructive Testing.

Sonic Inspection by the Immersion Technique, by D. Erdman, Triplett & Barton, Inc., and Rebecca Smith, Turbodyne Corp., Los Angeles. Non-Destructive Testing.

High Voltage X-ray Equipment and Technique, by E. E. Charlton, General Electric Research Laboratory. Non-Destructive Testing.

Non-Destructive Hardness Testing, by D. L. Palmer, Scintilla Magnetto Co. Non-Destructive Testing.

Xeroradiography—A Basic Development in X-ray Nondestructive Testing, by R. C. MacMasters, Battelle Memorial Institute, Columbus. Non-Destructive Testing.

10:00 A.M.

Campbell Memorial Lecture, by E. H. Dix, Jr., Assistant Director of Re-

Cutting dead weight pays dividends —increases output and lower cost. You can save more weight with Dow

MAGNESIUM

the world's lightest structural metal!

The users of all types of industrial equipment are more and more appreciating the dollars and cents value of *lightness*. That's why there is a growing demand among these people for equipment made of magnesium. They know that only with magnesium can they obtain the ultimate in combined light weight, strength and rigidity.

Magnesium is the lightest structural metal you can buy. It's 33⅓% lighter than aluminum and just ¼ the weight of steel. Yet for all its lightness, magnesium is a remarkably strong and usable material.

Magnesium is versatile, too. It is available in extrusions, die castings, forgings, sand and permanent mold castings, as well as sheet, plate, and strip. It is readily and easily fabricated by conventional shop procedures.

To see how leading designers in many fields are making magnesium pay dividends in increased efficiency and lower costs, write for your free copy of "How Magnesium Pays". It can pay you, too.

Simplify design and speed production with light weight, low-cost Magnesium Extrusions

An almost unlimited *variety of shapes* can be extruded at low cost in magnesium. Thus designers can use more efficient sections. This simplifies shop procedures because costly forming and fabrication from standard shapes and sheets is eliminated. You'll find that on many counts—versatility, workability, cost—it will pay you to use magnesium extrusions.

Lighter Products Sell—make your product Magnesium Light!

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MANY SHAPES, MANY FINISHES
. . . For Thousands of Uses!

Quality control at Seneca allows you to plan production without future worries about material variations. Iron, steel, low carbon, high carbon, tempered or untempered, aluminum and bronze wire are all produced according to the same high standard.

● *Shapes*

Square—Keystone—Flat-Round—Half-Round—Special Shapes—Straightened and cut.

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Number 40 W & M Gauge (.007) and larger.

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Liquor Finish—Bright Galvanized—Coppered—Enameled All Colors—Annealed—Tinned—Oil Tempered.

●●●● *Thousands of Uses*

Aircraft	Cable	Hair Pin	Reed
Armor	Car Seal	Hat	Regulator Spring
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Bobby Pins	Curtain Springs	Link Fabrics	Special Springs
Bonnets	Drapery Pin	Lock Springs	Spiral Binding
Bookbinders	Fish Hook	Mattresses	Stapling
Bottlecap	Fish Tape	Needle	Stitching
Box Stitching	Florist	Picture Cord	Umbrella
Brooms	Fuse	Pins-Ropes	Valve Spring
Brushes	Glass Netting	Pin Ticket	Weaving
Button	Grape Tying	Piston Ring	Wire Cloth
	Gutter Broom	Plow Steel	

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METAL SHOW PROGRAM

Continued

search, Aluminum Co. of America. ASM.

2:00 P.M.

ANNEALING TWINS—KINK BANDS

Origin of Annealing Twins in Brass, by R. C. Maddin, C. H. Mathewson and W. R. Hibbard, Jr., Yale University. AIME.

Annealing Twins in Copper and 70-30 Alpha Brass, by W. R. Hibbard, Jr., Jon Chao Liu and S. F. Reiter, Yale University. AIME.

Structure and Nature of Kink Bands in Zinc, by J. B. Hess and C. S. Barrett, University of Chicago. AIME.

Vapor Pressure of Zinc and Cadmium Over Some of Their Silver Alloys, by C. E. Birchenall and C. H. Cheng, Carnegie Institute of Technology. AIME.

POWDER METALLURGY

Method of Examination of Sections of Fine Metal Powder Particles with the Electron Microscope, by L. Delisle (Miss), Sylvania Electric Products, Inc. AIME.

Pore Size of Hydrogen Reduced Tungsten Powder, by B. Kopelman and C. C. Gregg, Sylvania Electric Products, Inc. AIME.

Determination of Boundary Stresses During the Compression of Cylindrical Powder Compacts, by M. E. Shank and J. Wulff, Mass. Institute of Technology. AIME.

Dilatometric Study of the Sintering of Metal Powder Compacts, by P. Duwez and H. Martens, Calif. Institute of Technology. AIME.

Electrical Resistivity Measurements on Iron-Silicon Compacts Prepared by the Powder Metallurgy Procedure, by F. W. Glaser, American Electro Metallurgical Corp. AIME.

TITANIUM-BERYLLIUM

Lattice Parameters of High Purity Alpha Titanium and the Effect of Oxygen and Nitrogen on Them, by H. T. Clark, Jr., Remington Arms Co., Inc. AIME.

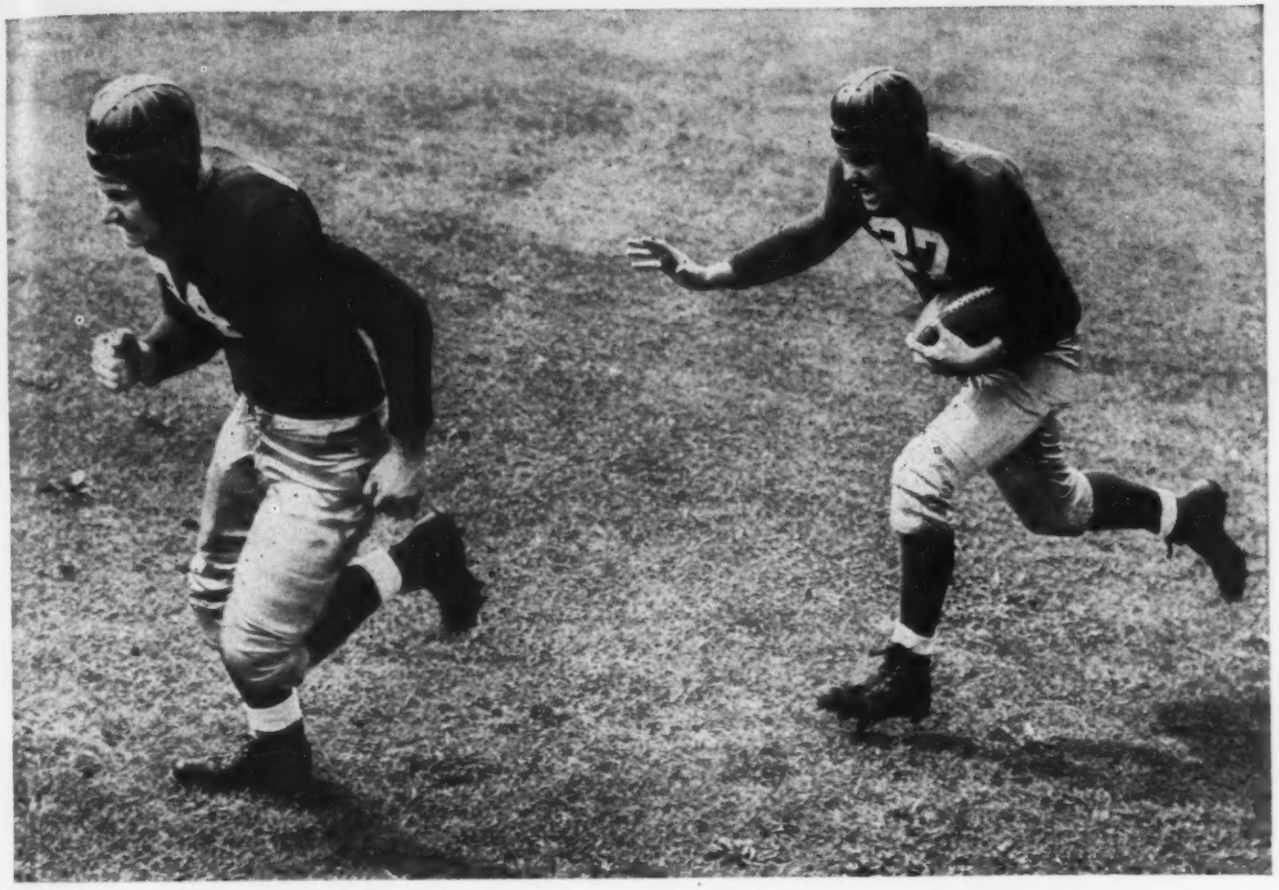
Effect of Oxygen, Nitrogen and Hydrogen on Iodide Refined Titanium, by R. I. Jaffee and I. E. Campbell, Battelle Memorial Institute. AIME.

Preparation and Castings of Beryllium Melts, by J. K. Kura, J. A. Jackson, M. C. Udy and L. W. Eastwood, Battelle Memorial Institute. AIME.

Metallographic Examination of Beryllium Alloys, by M. C. Udy, G. K. Manning and L. W. Eastwood, Battelle Memorial Institute. AIME.

TRANSFORMATION IN STEELS and TEMPER BRITTLENESS

Measurement of Retained Austenite in Carbon Steels, by B. L. Averbach.



"BIG GAIN"

A big gain by a hard driving back brings cheers of approval from the crowd. Everyone admires a dependable player—the man who comes through when the chips are down.

When steel was in heavy demand, as well as in periods of availability, The Wisconsin Steel Organization has always been keyed to fill orders as acknowledged. We believe our customers approve and appreciate that dependability.

When you need steel make a big gain by contacting our sales and technical staffs. Their every move is devoted to serving you.

INTERNATIONAL HARVESTER

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WISCONSIN STEEL

= NO Down-Time

Plant Superintendent looks at MONARCH SOLID TIRES

No down time for tire maintenance—right! But that's only part of the story. Monarch Solid Tires have an extra long service life, so they lower materials handling costs that way, too. They're tough, stable, sure-footed, and they can't puncture—Monarch-equipped vehicles go anywhere in the plant.

Monarch specialization pays off for you in better industrial tires, including such special types as Monarch Easy-Roll, Cushion, Static Conductor, and Neoprene Tires.

Write for specific information on the use of Monarch Solid Tires in your plant. THE MONARCH RUBBER CO., 301 Lincoln Park, HARTVILLE, OHIO.

Specify Monarch Solid Tires on your industrial vehicles. Replacement tires available from the manufacturer of your equipment.

MONARCH

Specialists in Industrial Solid Tires and Molded Mechanical Rubber Goods

METAL SHOW PROGRAM

Continued

L. S. Castleman and M. Cohen, Mass. Institute of Technology. ASM.

Effect of Alloying Elements on the Transformation Characteristics of Induction Hardened Steels, by J. F. Libsch, W. P. Chuang and W. J. Murphy, Lehigh University. ASM.

Influence of Composition on Temper Brittleness in Alloy Steels, by A. P. Taber, Colonel, Ordnance Dept., J. F. Thorlin, Lt. Colonel, Ordnance Dept., and J. F. Wallace, Watertown Arsenal. ASM.

Isothermal Temper Embrittlement, by L. D. Jaffe and D. C. Buffum, Watertown Arsenal Laboratory. ASM.

INDUSTRIAL NON-DESTRUCTIVE TESTING

Current Applications of Magnetic Analysis Inspection, by V. L. Spoley, Magnetic Analysis Corp., Long Island City, N. Y. Non-Destructive Testing.

Plastics Inspection by Special Low Voltage X-ray Equipment, by D. T. O'Connor, Naval Ordnance Laboratory. Non-Destructive Testing.

Testing of Jet Engine Parts, by Tom Piper, Northrop Aircraft Co. Non-Destructive Testing.

Simulated Service Testing for Establishing Nondestructive Testing Standards, by L. W. Ball, Naval Ordnance Laboratory. Non-Destructive Testing.

Thursday, October 20

9:30 A.M.

STAINLESS STEEL

Bar-Bend Test and Its Application to Stainless Steel, by C. A. Zapffe, R. L. Phebus and F. K. Landgraf, Consultants. ASM.

Creep and Rupture of Several Chromium-Nickel Austenitic Stainless Steels, by G. V. Smith, E. J. Dulis and E. G. Houston, Research Lab., U. S. Steel Corp. ASM.

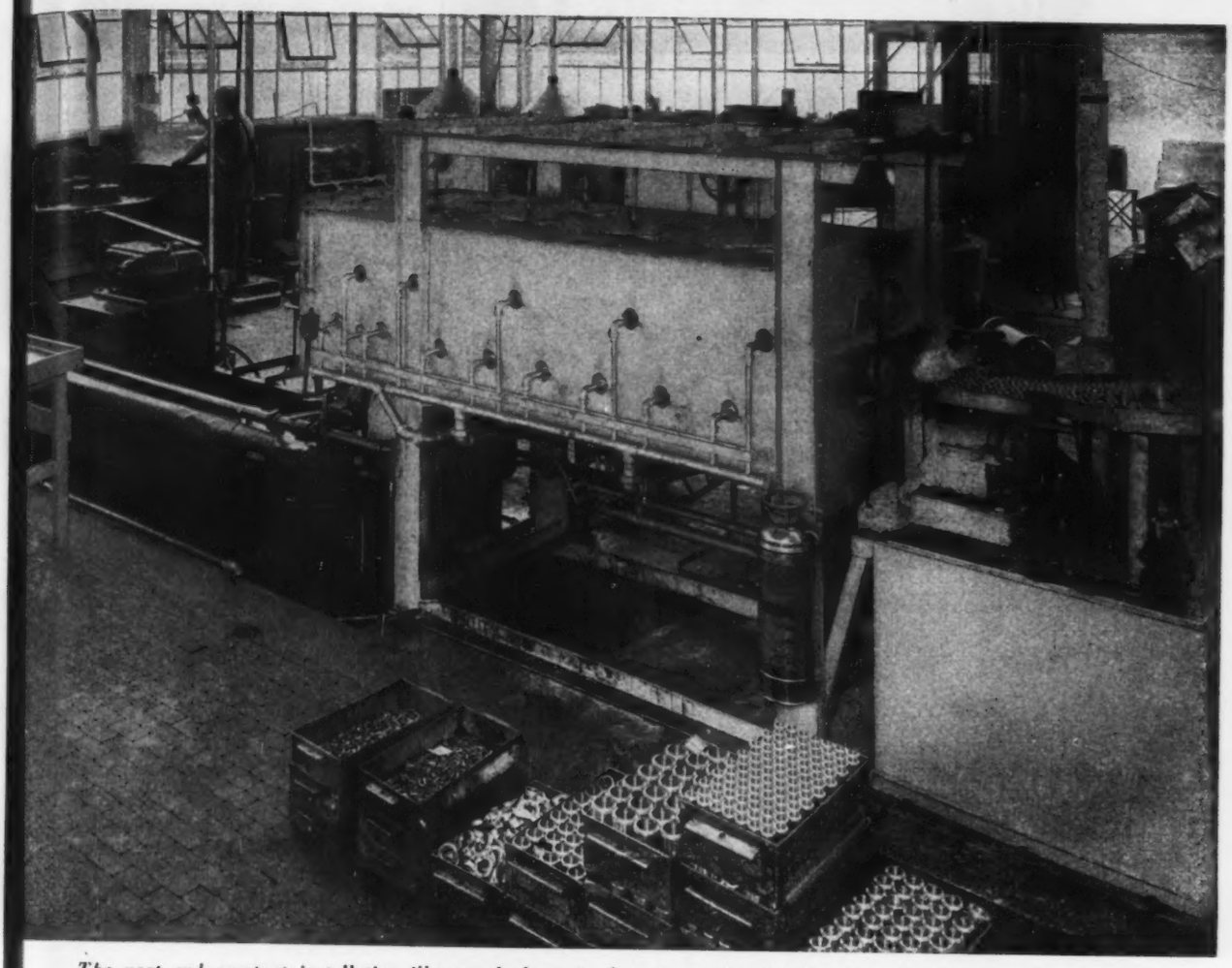
Effect of Sigma Phase on the Short Time High Temperature Properties of 25 Chromium-20 Nickel Stainless Steel, by G. J. Guarnieri, J. Miller and F. J. Vawter, Cornell Aeronautical Laboratory, Inc. ASM.

Stress Corrosion of a Stainless Steel Compressor Through Unbalanced Dynamic Loading and Exposure to a Mildly Corrosive Solution, by F. W. Davis, E. B. Badger & Sons Co. ASM.

ARCS AND ELECTRODES

Arc Welding Metal Transfer Analyzer, by R. C. McMaster, D. C. Martin and A. Leatherman, Battelle Memorial Institute. AWS.

Heat Effects in Anode Spots of High-Current Arcs, by T. Benjamin Jones, Johns Hopkins University. AWS.



The neat and compact installation illustrated above is that of our No. 166 Reciprocating Furnace with Automatic Quench Tank as installed at the Jacobs Manufacturing Company plant for the case hardening and clean hardening of various parts. One of the reasons this furnace was selected in place of a cyanide bath, the method previously employed, was that it eliminated the difficult cleaning job on threaded parts such as chuck jaws, chuck nuts, etc.

A. G. F. RECIPROCATING FURNACES FOR PRODUCTION HEAT TREATING

The following are but a few of their many desirable features:

VERSATILE. Each furnace can be used without modification to process work ranging from extremely small, light springs, stampings, and drop forgings, etc., up to quite large and heavy pieces.

POSITIVE ATMOSPHERE CONTROL. The full muffle type Reciprocating Furnace has been redesigned to provide a 100% atmosphere seal.

SIMPLE. There is no complicated drive mechanism or conveyor belt maintenance problem. Only the work, advancing through the muffle by its own momentum, enters and leaves the furnace.

ECONOMICAL. Increased production per man-hour, long alloy life, and minimized maintenance produce a lower heat treating cost per unit of work treated.

VISIT A.G.F. AT THE METALS SHOW
(AMERICAN GAS ASSOCIATION EXHIBIT)

AMERICAN GAS FURNACE CO.

1004 LAFAYETTE STREET ★ ELIZABETH, N. J.

TOP OPERATING EFFICIENCY

FOR *at Reduced Maintenance Cost*

PRODUCT IMPROVEMENT...

PLANT ENGINEERS RECOMMEND

Schmieg DUST AND FUME CONTROL EQUIPMENT

Below is shown a 14000 CPM Centri-Merge Arrester Unit on a cast iron dust exhaust system.

CYANIDE FURNACES fume exhaust system is connected to a Centri-Merge Washer.

To Fit Both Plant and Product

Dust and fume control equipment correctly designed and manufactured is of vital importance to the safety and health of plant personnel, and results in product improvement. Schmieg engineers pioneered this principle of dust and fume control.

Plant engineers call upon Schmieg to design and build dust and fume control equipment to fit both plant and product. Typical installations by Schmieg include dust and dirt arresters, fume exhaust air washers, kerosene and welding fume exhaust units, stock and dust handling equipment in textile plants, cyclone collectors for brake lining dust, polishing and buffing dust collectors... to name just a few.

Schmieg dust and fume control units give you (1) reduced operating and maintenance expense, and (2) maximum efficiency in the removal of dust and fumes for improvement of working conditions and product quality.

DISC SANDING BOOTH Proper ventilation keeps dust from escaping to other parts of plant.

THE *best* AIR PURGE *is* CENTRI⊗MERGE

Our engineers will be pleased to consult with you in the solution of your problem

Schmieg INDUSTRIES INC.
Engineers & Manufacturers

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METAL SHOW PROGRAM

Continued

Application of Mild Steel Welding Electrodes, by F. R. Strate, Air Reduction Sales Co. and R. I. Strough, Acrods Corp. AWS.

Energy Distribution in Electric Welding, by C. E. Jackson and A. E. Shrubsall, Union Carbide and Carbon Res. Labs. AWS.

RAILROAD

Evolution of the Welded Freight Car, by L. E. Grant, Chicago, Milwaukee, St. Paul & Pacific Railroad Co. AWS.

Oxy-Acetylene Pressure-Welded Rail Saves Maintenance Costs, by L. Adams, Oxweld Railroad Service Co. AWS.

Arc Welding in Railroad Shops, by E. DiLiberti, Air Reduction Sales Co. AWS.

Inert Gas Welding in Railroad Repair and Rehabilitation, by H. E. Gannett, Chicago, Burlington & Quincy Railroad. AWS.

WELDABILITY

Strain Aging in Welding Low-Carbon Structural Steel, by W. H. Bruckner and S. W. Sandberg, University of Illinois. AWS.

The High-Frequency Notch Bend Test, by B. Ronay, U. S. Naval Engrg. Exp. Station. AWS.

Studies Concerning the Strain-Aging of Arc Welds in Mild Steel, by A. E. Flanigan, University of California. AWS.

Synthetically Heat Treated Specimens for Weldability, by E. F. Nippes and W. Savage, Rensselaer Polytechnic Institute. AWS.

NONDESTRUCTIVE TESTING IN MANAGEMENT

Training and Qualifications for a Career in a Commercial X-ray and Non-destructive Testing Laboratory, by Justin Schneeman, X-Ray Products Corp. Non-Destructive Testing.

Career Possibilities for Nondestructive Specialists in a Large Metallurgical Company, by Kent Van Horn, Aluminum Co. of America. Non-Destructive Testing.

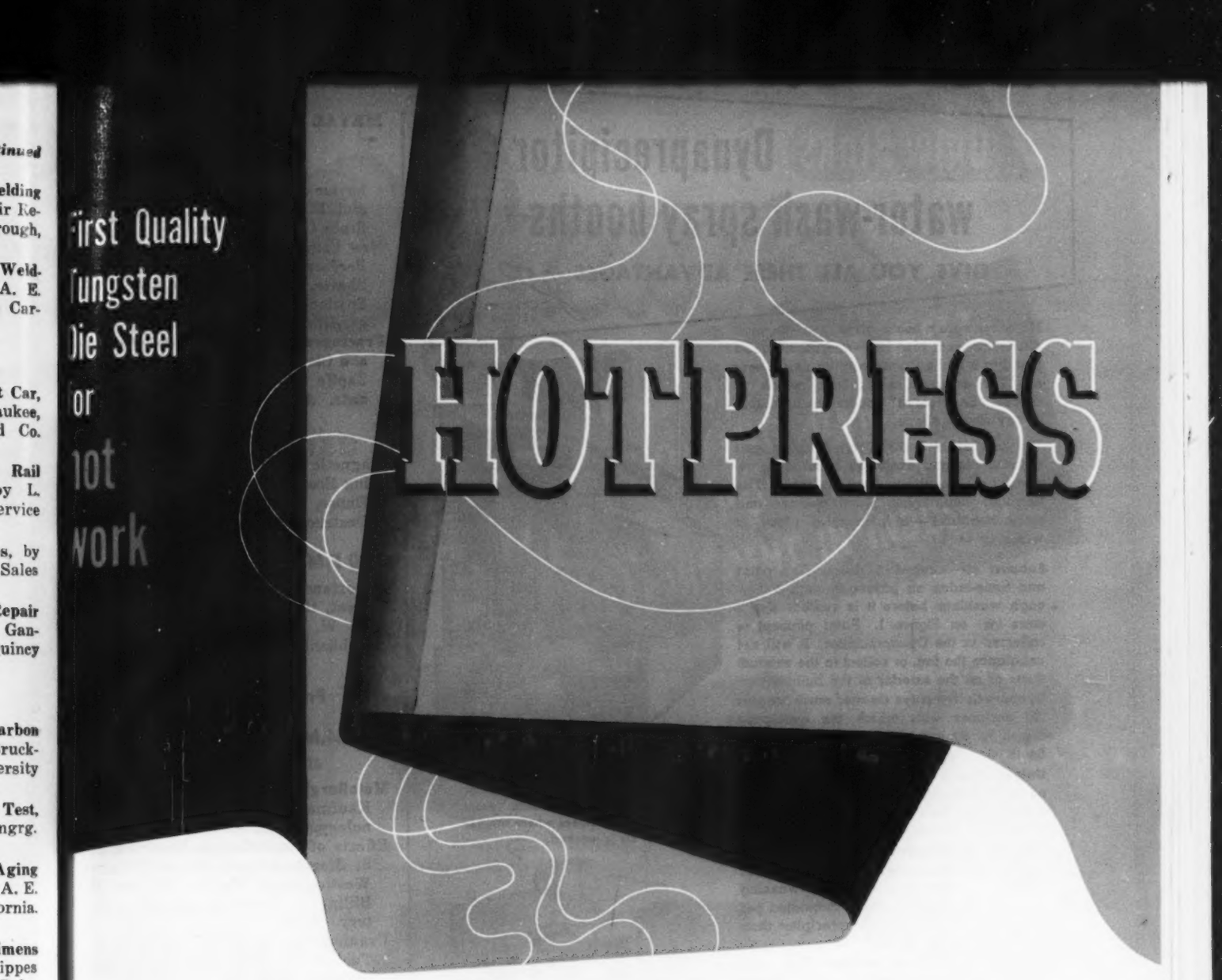
Peacetime Preparation for Quality Control During Industrial Mobilization, by W. R. Pabst, Quality Control Div., Navy Bureau of Ordnance. Non-Destructive Testing.

2:00 P.M.

MECHANICAL METALLURGY

New Equipment for Damping Capacity, Elasticity, and Fatigue Testing and the Correlation of These Properties for Mild Steel, by B. J. Lazan, Syracuse University. ASM.

Effect of Study Stress on Fatigue Be-



Famous for resisting high temperatures without checking or cracking . . . widely used in hot press forming of steel and brass

This low carbon, high tungsten steel *stands up* under dull red heat in severe die applications. It is fine for dies and dummy blocks in rod and tube extrusion . . . excellent in upsetter machine service . . . and tops for dies for hot forming brass and steel on presses. HOTPRESS is a good steel to know and use. Let us arrange an introduction!

FIRST QUALITY TOOL STEELS

Vanadium-Alloys
STEEL COMPANY
LATROBE, PENNA.

Colonial Steel Division — Anchor Drawn Steel Co.

Only Binks Dynaprecipitor water-wash spray booths

GIVE YOU ALL THESE ADVANTAGES

J. L. Roche
Chairman of the Board

No other spray booth gives you the high efficiency and low cost operation to be found in a Binks Dynaprecipitor unit. There are 148 standard sizes from which to choose. "Engineered" booths are available in any size or shape.

The use of a Binks Dynaprecipitor unit reduces fire and explosion hazards by removing all overspray from the room. The finishing department stays cleaner and more healthful — a pleasanter place in which to work.

Exhaust air washed 5 times: The paint and fume-laden air passes through 5 thorough washings before it is vented. See 5 stars (★) on Figure 1. Paint pigment is collected in the Dynaprecipitor. It will not unbalance the fan, or collect in the exhaust ducts or on the exterior of the building.

Dynaprecipitor stays cleaner much longer: All surfaces with which the overspray comes in contact are constantly flushed. Booth cleaning time is minimized.

Unique clog-proof construction: There are no nozzles to clog. The water is distributed directly from the large manifolds by means of deflector plates.

Uniform distribution of large water volume: There are no breaks in the water curtains . . . no gaps in the air-washing spray. There is more water circulated per lineal foot of a Binks Dynaprecipitor than any other booth.

Efficient paint reclamation: This unit washes out and collects an exceptionally high percentage of the overspray for reclamation. Heavy solids and light pigments collect in the fore part of the pan and are prevented by a divider in the pan from recirculation through the system.

Manifolds constantly flushed: The water constantly circulates through the manifolds to prevent settlement of sediment. This is illustrated in Figure 2.

Water economy: The water is circulated over and over again. Moisture eliminators remove all of the water from the air before it is vented.

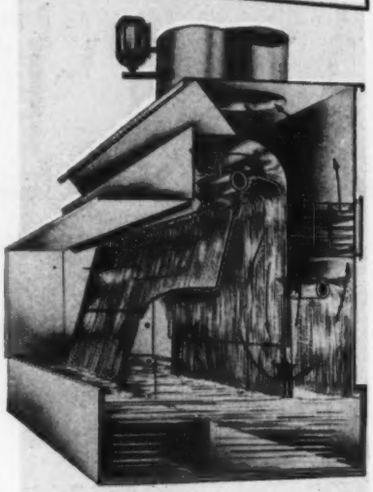


FIG. 1
Diagram showing passage of air through a Binks Dynaprecipitor water wash spray booth. Stars (★) mark 5 places where the exhaust air is washed.

FIG. 2
Diagram showing the water circulating system.

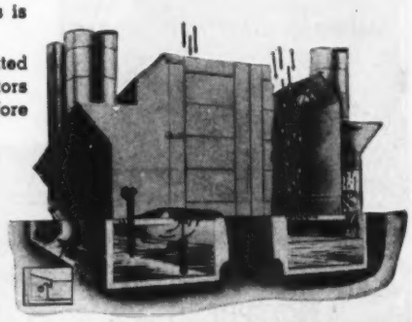


FIG. 3
Diagram of a Binks down-draft Dynaprecipitor unit, showing the flexibility of the Dynaprecipitor principle. In this booth the air is vented through grills in the floor. This layout is ideal for use with heavy products such as automobiles, railway cars, etc.

Binks *Send now* for your free copy of our new Catalog-Data Book.

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ST. LOUIS SAN FRANCISCO SEATTLE WINDSOR, ONTARIO, CANADA

METAL SHOW PROGRAM

Continued

havior of Aluminum, by J. A. Sauer and D. C. Lemmon, Pennsylvania State College. ASM.

New Criteria for Predicting the Press Performance of Deep Drawing Sheets, by W. T. Lankford, S. C. Snyder and J. A. Bauscher, Carnegie-Illinois Steel Corp. ASM.

Fractographic Study of Deformation and Cleavage in Ingot Iron, by C. A. Zapffe and C. O. Worden, consultants. ASM.

LESTER LECTURE

Magnetic Inspection Methods Stressing Economy in Production, by L. A. Danse, General Motors Corp. Non-Destructive Testing.

8:00 P.M.

Importance of Welding to Management, the Engineer and the Public, by W. T. Chevalier, McGraw-Hill Publishing Co. AWS.

Friday, October 21

9:30 A.M.

ATOMIC ENERGY METALLURGY

Metallurgy of Beryllium, by A. R. Kaufmann, Mass. Institute of Technology. ASM.

Effects of Radiation on Materials, by S. Siegel, Atomic Power Division, Westinghouse Electric Co., and D. Billington, Naval Research Laboratory. ASM.

Uranium Crystal Structure, by C. W. Tucker, Knolls Atomic Power Laboratory. ASM.

Elastic Constants of Uranium, by H. Laquer, Los Alamos National Laboratory. ASM.

Some Uranium Phase Diagrams, by H. A. Wilhelm, the Ames Laboratory. ASM.

INERT GAS WELDING

Heliarc Welding in the Automotive Industry, by F. J. Pilia and R. H. Bennewitz, Linde Air Products Co. AWS.

Inert Gas Shielded Metal Arc Welding Process, by A. Muller, G. J. Gibson and E. H. Roper, Air Reduction Sales Co. AWS.

Automatic Heliweld Applications, by H. O. Jones, Air Reduction Sales Co. AWS.

Applications for Helium in Inert Arc Welding, by M. J. Conway, General Electric Co. AWS.

STAINLESS STEEL

Corrosion Resistance of Molybdenum Bearing Stainless Steel Weld Metals, by R. D. Thomas, Jr. and A. L. Schaeffler, Arcos Corp. AWS.

Problems Associated with the Weld-

D.O.James

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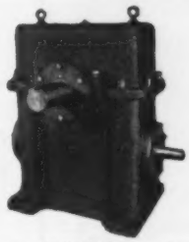
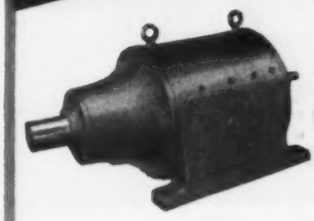
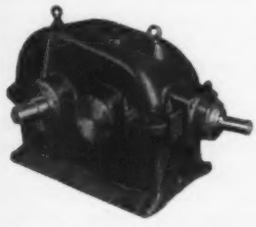


Type "H" Worm Gear



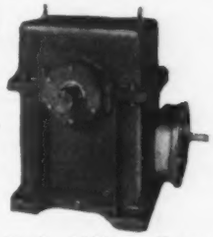
Straight Line Gear Reducer

Motorized Reducers



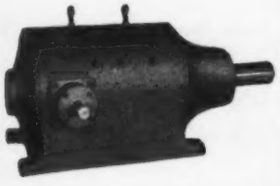
Spiral Bevel Herringbone

Double Worm Gear

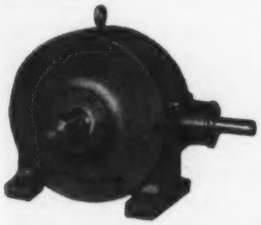


Helical Worm Gear

Motorized Worm Gear



Right Angle Gear Reducer



Spiral Bevel Gear

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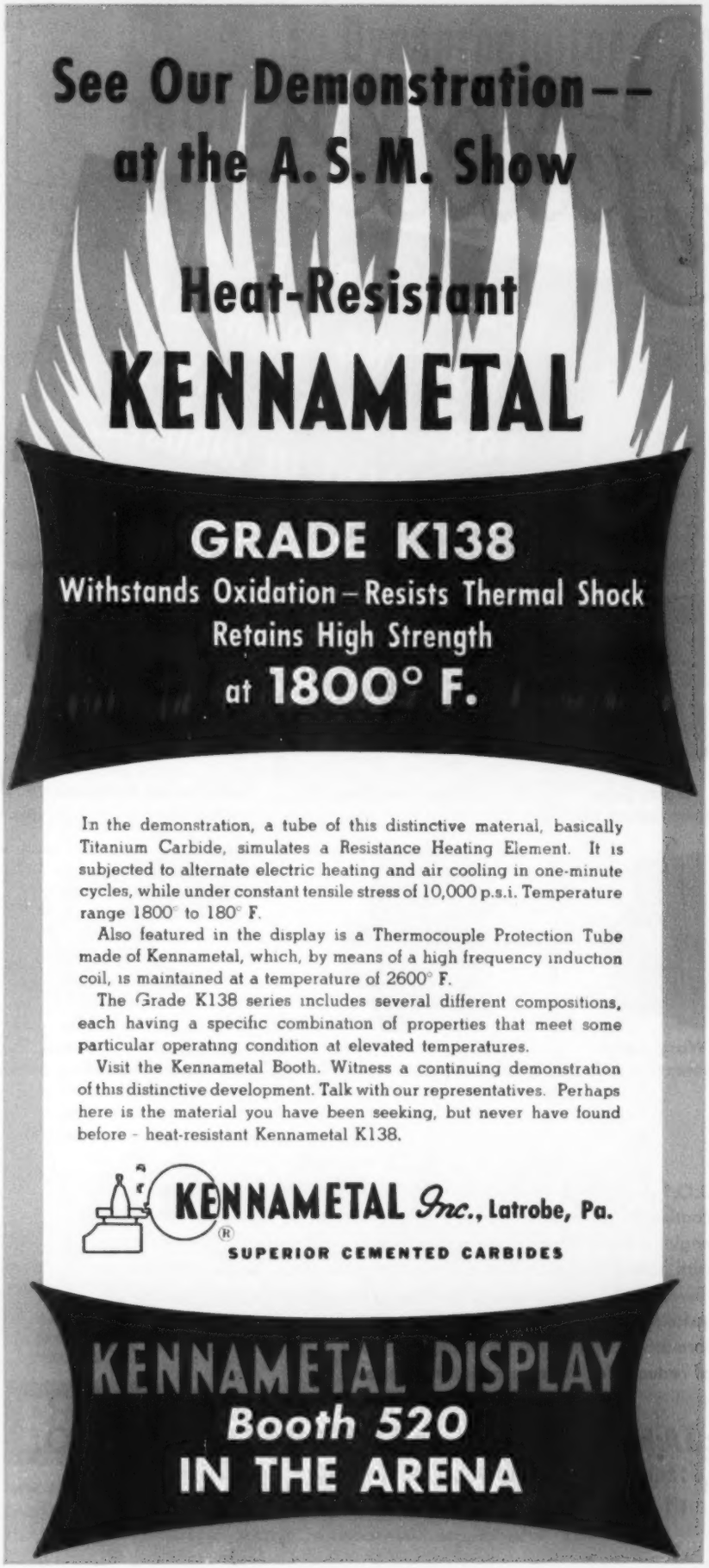
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METAL SHOW PROGRAM

Continued

ing of Stainless Clad Steel, by P. C. Arnold, Chicago Bridge & Iron Co. AWS.

Resistance Welding Stainless Steel Truck-Trailer Body Components, by B. Gates, the Budd Co. AWS.

Stainless Steel Fabrication by Inert-Gas-Shielded Arc Welding, by C. D. Bonifield, the Globe Co. AWS.

GAS CUTTING

New Developments in Oxyacetylene Cutting Machines, by W. Begerow and A. H. Yoch, Air Reduction Sales Co. AWS.

Steel Warehouse Shape Cutting with Electronic Tracers, by W. O. Springer, Jos. T. Ryerson & Son, Inc. AWS.

Flame Cutting, by J. T. Lewis, Lewis Welding & Engineering Corp. AWS.

Powder Cutting and Scarfing Process, by C. W. Powell, Republic Steel Corp. AWS.

2:00 P.M.

NONFERROUS

Fabrication and Mechanical Properties of Ductile Zirconium, by E. T. Hayes, E. D. Dilling and A. H. Roberson, Bureau of Mines, Northwest Electrodevelopment Laboratory. ASM.

Study of Arc-Melted Molybdenum-Rich Chromium-Molybdenum Alloys, by H. D. Kessler and M. Hansen, Armour Research Foundation. ASM.

Effects of Quenching Rate and Quench-Aging on the Tensile Properties of Aluminum Alloy 61S, by R. C. Lemon and H. Y. Hunsicker, Aluminum Co. of America. ASM.

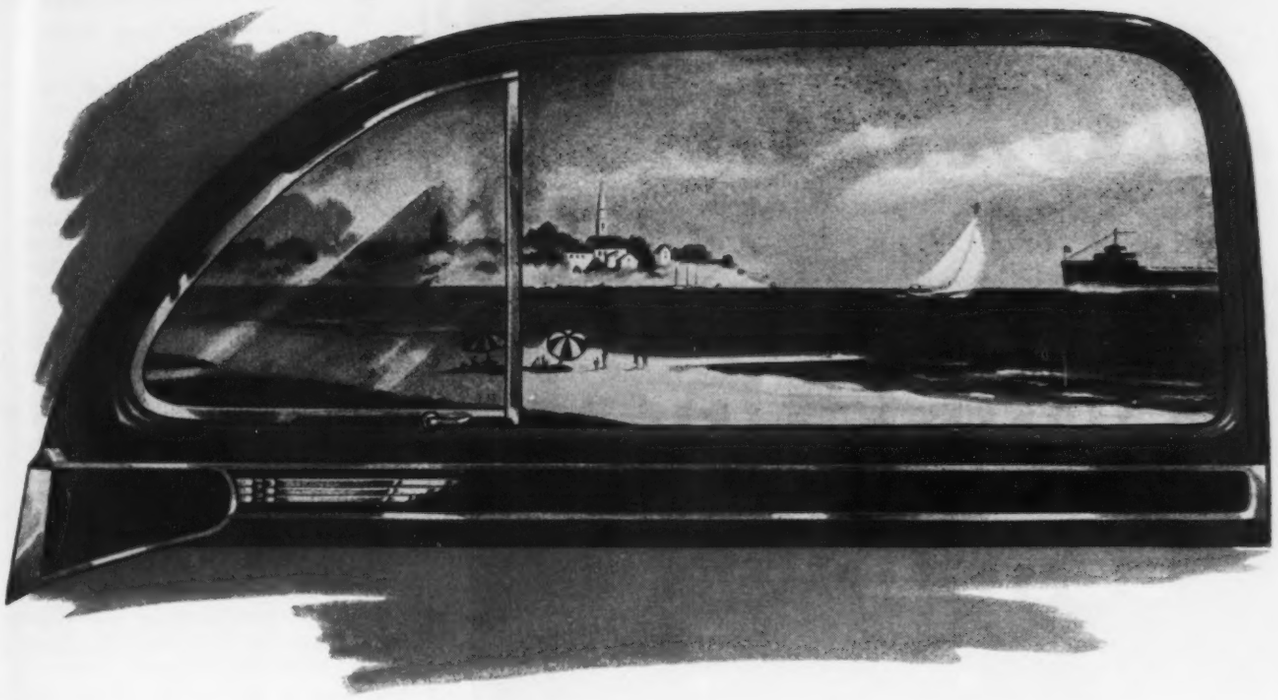
Preparation of Metal Single Crystals, by A. N. Holden, General Electric Co. ASM.

Resume Your Reading on Page 79

Aircraft Engineers Meet

New York—Engineering representatives of American military forces and plane manufacturers jointly will undertake a comprehensive study of the requirements of producibility at the SAE National Aeronautic Meeting to be held Oct. 5-8 in Los Angeles.

Major emphasis of the meeting will be placed on ways and means of assuring production in the event of war of the largest quantity of efficient planes in the shortest possible time with the minimum of materials and cost.



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METAL SHOW EXHIBITORS

Continued from Page 79

B-A Coupling Co., Inc. (See Clark Sales Corp.)

Baker & Co., Inc., Newark 5, N. J. Booth 2419. Industrial and laboratory furnaces; purifiers and dryers.

Baldwin Locomotive Works, Eddystone, Pa. Booth 1033. Universal testing machines; tensile, fatigue and impact machines; SR-4 load cell extensionometers.

Bastian-Blessing Co., Chicago 30. Booth 437. Regulators, valves, manifolds, fittings.

Bath Corporation, Cyril, Cleveland. Booth 2138. Contour formers; presses; dies and tools.

Bausch & Lomb Optical Co., Rochester 2, N. Y. Booth 432. Research metallographs, microscopes.

Bishop & Co., J., Malvern, Pa. Booth 2007. Platinum and stainless steel products; small tubular specialties.

Black Drill Co., Cleveland 17. Booth 303. Drills for hardened steels.

Blakeslee & Co., G. S., Chicago 40. Booth 2236. Solvent degreasers and metal parts washers.

Braeburn Alloy Steel Corp., Braeburn, Pa. Booth 317. Toolsteels.

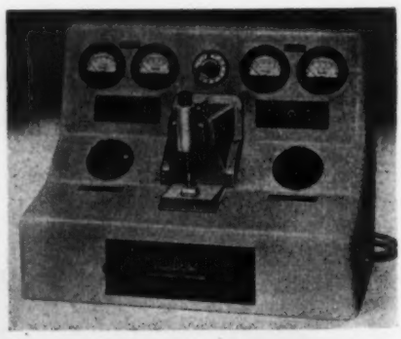
Bridgeport Brass Co., Bridgeport 2, Conn. Booth 825. Brass and copper alloy products; tubing; wire; shapes; welding rod.

Bruning Co., Inc., Charles, Chicago 41. Booth 2101. Printing, developing and drafting equipment.

Brush Beryllium Co., Cleveland 3. Booth 2554. Beryllium metal, alloys and products.

Brush Development Co., Cleveland. Booth 1114. Surface analyzers; strain analyzers; contour analyzers.

Buehler Ltd., Chicago 1. Booth 513. Metallurgical laboratory equipment; microtesting machines; optical equipment.



Buehler-Waisman electropolisher.

Bundy Tubing Co., Detroit 14. Booth 1214. Tubing.

By-Products Steel Co. Div., Coatesville, Pa. Booth 503. (See Lukens Steel Co.)

Turn to Page 254

FACTS FROM THE FIELD

Reports show how Houghton "know-how" saves time— saves money

A sure way to cut costs without spending huge sums for new equipment is to examine the processing materials used to shape, form and heat-treat metal parts. Houghton makes and services such materials. Its success over the years has been based on ability to reduce production costs and solve perplexing problems for metal men. Below are authenticated case studies, briefed for quick reading. One or more may touch your own procedures:

DRAWING — A farm machinery manufacturer was punching and coining bars from ½" hot-rolled plate. Using white lead in oil as a drawing lubricant cost them $52.98 a day. They tried *Houghto-Draw*, mixed with mineral oil and then with water. Punches were brushed with the mixture every four operations as against each operation previously. Result: daily cost with Houghto-Draw, $4.38; saving: $48.60 per day.

CLEANING — A bolt manufacturer had the tough job of removing asphaltic-type rust preventive from surplus stock so it need not be scrapped. *Houghto-Clean 220*, an emulsion cleaner, was suggested, diluted 1 to 5 with water. It worked, where steam and alkaline cleaners had failed. In barrel-type washers the same product used in 4% solution lasts several weeks, with small weekly make-up. Former method required daily additions, increasing cost of cleaning.

CUTTING FLUIDS — An automotive parts maker changed its cutting oil used in an automatic on SAE 1045 bar stock, from a straight oil costing 49¢ per gallon, to Houghton's *Antisep All-Purpose Base*, mixed 1 to 15 with water. This dilution has been used 8 months both as cutting fluid and machine lubricant. Cost of cutting oil alone, for 40 working days: $52.90 for Antisep against $404.50 for straight oil. No lubricating oil required. Tool life improved . . . no sign of bearing wear or corrosion . . . parts handled bare-handed . . . no dermatitis complaints . . . better finish obtained.

FORGING — Replacing a lanolin-graphite mixture used on forging presses, Houghton's *Hot Forging Agent*, cut 50-50 with mineral oil, reduced cost of forging lubricant 67%. Die life was improved and forgings came through with better finish.

MARTEMPERING—Abundant proof of freedom from distortion due to interrupted quench is available. We cite just one instance: Ball-bearing races formerly were pre-heated, hardened, quenched (cold) air-cooled and drawn. Rejections were up to 10%. Process was changed to heating and martempering in salt. Result: no rejects; cost of heat treatment reduced from $.0417 to .0059 per race.

SALT BATH CARBURIZING—Houghton's *Perliton "W"* (water-soluble carburizer) replaced former cyanide bath used to case-harden roller bearing end plates. Time reduced from 10 to 5 minutes, with greater hardness and elasticity without fracture. Furnace produced 30% more work per day with Perliton "W." That's economy!

GRINDING—An aircraft plant changed to *Antisep Soluble Oil* as a grinding coolant, after complaints on finish. Antisep cost was $.0097 per gallon, diluted, as against .0203 per gallon for former coolant. Finish was improved. That's saving!

RUST REMOVAL AND PREVENTION—A spring manufacturer had stored steel wire which was later found to have rusted. To remove rust and protect the wire during subsequent forming operations, *Houghto-Clean Rust Remover* was used, diluted 1 to 3 with water. After water rinse, the wire was dipped in Houghton's Rust Veto 266, a fingerprint neutralizer and preservative. Pickling not necessary. Here was a saving in both material and in processing.

●

Those are but quick sketches of case studies reported by users. Want more? Or, want to know how these products and the "Know-How" behind them can be applied to *your* operations to cut costs? Then ask the Houghton Man when he calls, or write to the address below. It's headquarters for metal-working ideas and materials.

E. F. HOUGHTON & CO.
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METAL SHOW EXHIBITORS

Continued from Page 250

Campbell Machine Div., American Chain & Cable Co. Inc., Bridgeport 2, Conn. Booth 925. Abrasive cutting machines; nibbling machines.

Carpenter Mfg. Co. (See Clark Sales Corp.)

Central Scientific Co., Chicago 13. Booth 1506. Laboratory apparatus.

Champion Rivet Co., Cleveland 5. Booth 531. Welding electrodes and holders; rivets, pins and bushings; sample weldments.

Cincinnati Milling & Grinding Machines, Inc., Cincinnati. Booth 1826. Flame hardening machine; machine tools.

Cities Service Oil Co., New York 5. Booth 919. Cutting and grinding oils; drawing compounds; greases.

Clark Sales Corp., Cleveland. Booth 1528. Ball, check and needle valves; couplings.

Cleco Division, Reed Roller Bit Co., Houston, Texas. Booth 2562. Air tools.

Cleco reversible pneumatic impact wrench.

Cleveland Electric Illuminating Co., Cleveland. Booth 526. Electrical power for industry.

Cleveland Punch & Shear Works Co., Cleveland. Booth 1837. Presses, clutches and press brakes.

Climax Molybdenum Co., New York 18. Booth 338. Molybdenum and molybdenum alloys; ores.

Clinton Machine Co., Inc., Clinton, Mich. Booth 219. Electrical machine for piercing hard metals.

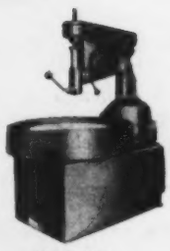
Coast Metals, Inc., Canton 6, Ohio. Booth 2329. Hard facing welding rod.

Colonial Steel Div. Booth 1401. (See Vanadium-Alloys Steel Co.)

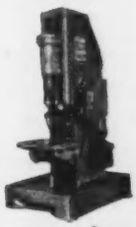
Commerce Pattern Foundry & Machine Co. Booth 2015. (See Upton Electric Furnace Division.)

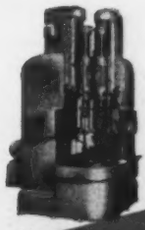
Commercial Shearing & Stamping Co., Youngstown 1, Ohio. Booth 1738. Pessed metal products; hydraulic hoist equipment.

Consolidated Engineering Corp., Pasadena 4, Calif. Booth 2514. Recording systems; spectrometers; computers; analyzers.


Model 844
MICROFLAT

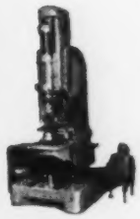
Model 705-2
HYDROHONER


Model 720
HYDROHONER


HYDROHONER

Model 721
HYDROHONER

Model 705-2
HYDROHONER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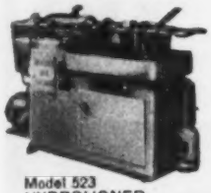
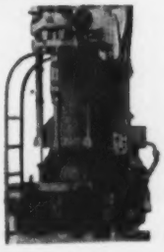
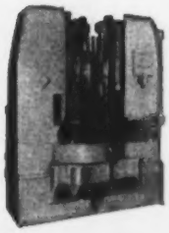
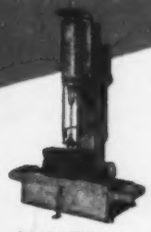
YOUR BEST MOVE *to cut your costs!*


Model 523
HYDROHONER

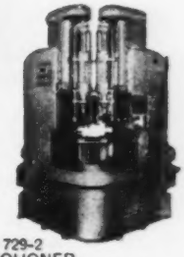

GAGE BAR MICROSIZE
Single Spindle


Model 726-3
HYDROHONER

Model 818
MICROFLAT


Model 718
HYDROHONER

GAGE BAR MICROSIZE
V-8 Multi-Spindle


Model 729-2
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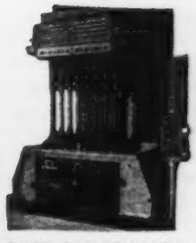
Completely finished bores of uniformly accurate geometry—final size—final surface finish—are generated in only one or two rapid stock removing operations by Micro-honing; no further machining is necessary!

Our twenty years of honing progress have produced these machines which are cutting costs for many manufacturers. They can help cut your costs, too! Let's explore it!


GAGE BAR MICROSIZE
Multi-Spindle

Model 821-2
MICROFLAT

Model 604
HYDROHONER

Model 844-2
MICROFLAT

MICRO MATIC

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT • DETROIT 4, MICHIGAN

DISTRICT FIELD OFFICES

1323 S. Santa Fe
LOS ANGELES 21, CAL

616 Empire Bldg.
ROCKFORD, ILL.

55 George St.
BRANTFORD, ONT., CAN.

MICROMOLD MANUFACTURING DIV.
GUILFORD, CONN.

"thickness control"

affects your cash register

★ Savings of $152.00 per 100 sheets of polished 18 gauge stainless steel are real savings! By specifying MicroRold — the Stainless Steel Sheets with "Thickness-Control"—you too can effect such savings. Here's how —

Standard steel buying practice has been to order by gauge number. You can order MicroRold by decimal thickness with a tolerance of only 3%, plus or minus, as compared to the allowable plus or minus of 10%.

Average saving in theoretical weight is 3.15 pounds per sheet, or $1.52 per sheet.

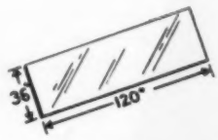
Cost of One Sheet of Polished 18 Gauge 36"x120"* when Thickness May Vary Plus or Minus 10%.

.052"— 65.52 Pounds — $31.61
.051"— 64.26 Pounds — $31.01
.050"— 63.00 Pounds — $30.40 (Theoretical Weight)
.049"— 61.74 Pounds — $29.79
.048"— 60.48 Pounds — $29.18
.047"— 59.22 Pounds — $28.57

Cost of One Sheet of Polished MicroRold .0475"x 36"x120", Plus or Minus 3% on Thickness.

.0475"— 59.85 Pounds — $28.88

Each one-thousandth inch (.001") variation in thickness represents 1.26 pounds on the standard 36"x120" sheet. *And you pay for steel by weight.*



So, you may save $152.00 per 100 sheets of polished 18 gauge sheets when you buy MicroRold—the Stainless Steel Sheets with "Thickness-Control."

**Savings are figured on a price of 48.25c per pound for Type 302 Stainless Steel, price including base; gauge, polish and quantity extras.*

MicroRold® Stainless Steel

WASHINGTON STEEL CORPORATION

119 WOODLAND AVENUE

WASHINGTON, PENNSYLVANIA

METAL SHOW EXHIBITORS

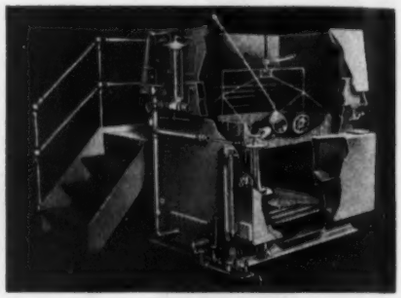
Continued

Contour Marker Corp., Compton, Calif. Booth 2531. Marking devices.

Crane Packing Co., Chicago 13. Booth 836. Metallic packings; mechanical seals, and lapping machine.

Delta File Works, Inc., Philadelphia 37. Booth 1753. Hand files; rotary power files.

Detrex Corp., Detroit 32. Booth 1210. Cleaning and degreasing equipment; cleaning compounds and solvents.



Detrex vapor spray degreaser.

Detroit Testing Machine Co., Detroit 13. Booth 1616. Tensile and ductility testers; Brinell machines.

Dietert Company, Harry W., Detroit 4. Booth 214. Carbon and sulphur determination equipment; Brinell reader; sand, core and mold testing equipment for the foundry.

Distillation Products, Inc., Rochester 13, N. Y. Booth 1907. Vacuum systems, gages, furnaces.

DoAll Company, Cleveland 3 and Des Plaines, Ill. Booth 1135. Sawing, filing and grinding equipment; gages; chucks; automatic selecting equipment.

Doughty Laboratories, New York. Booth 53. Steel hardening compound.

Dow Chemical Co., Midland, Mich. Booth 401. Magnesium; magnesium alloy products.

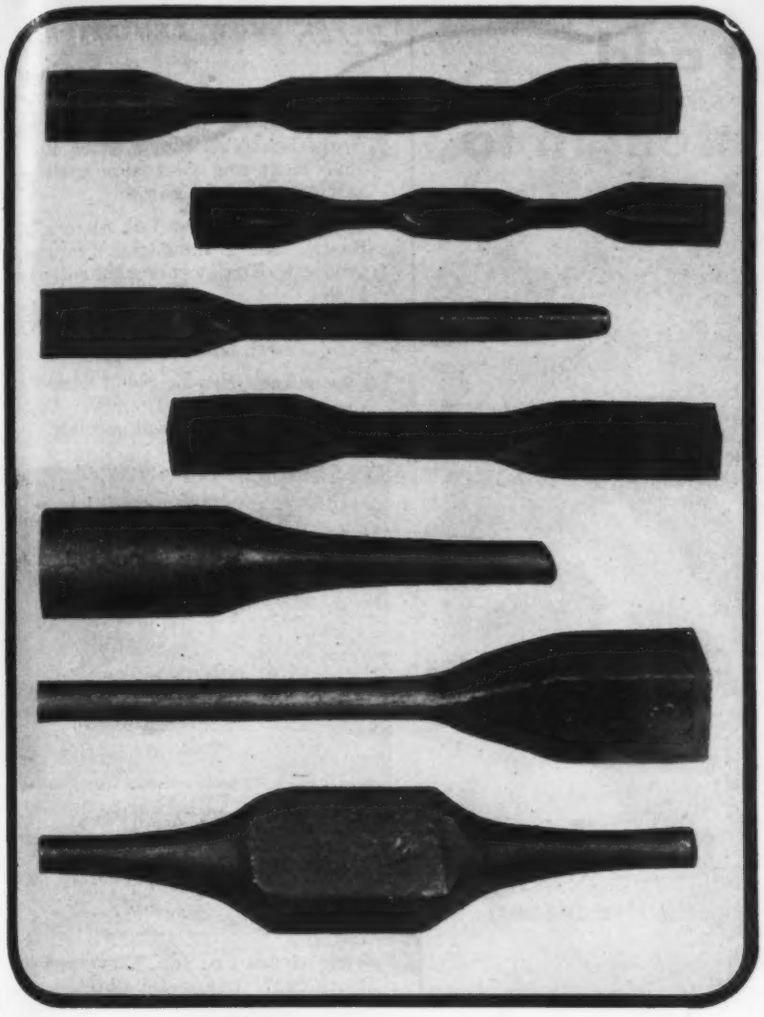
Driver Co., Wilbur B., Newark, N. J. Booth 1427. Heat and corrosion resistant alloys; wire ribbon and strip.

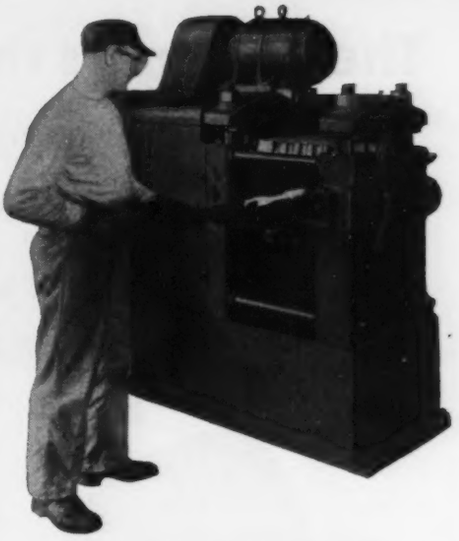
Ecco High Frequency Corp., North Bergen, N. J. Booth 2748. High-frequency induction heating

Eclipse Fuel Engineering Co., Rockford, Ill. Booth 2847. Industrial gas burners and furnaces.

Ekstrand & Tholand, Inc., New York 17. Booth 2532. Iron powders; alloy powders.

Electric Furnace Co., Salem, Ohio. Booth 1014. Gas-fired, oil-fired and electric heat treating furnaces; controlled atmosphere equipment.





AJAX ROLLS

For all sizes and types of FORGING BLANKS

Available in six sizes, AJAX Wide Adjustment Forging Rolls have capacities for pre-rolling forging blanks ranging from the smallest automobile valve rocker arm to the largest airplane propeller. And backing these, AJAX engineers have a priceless wealth of experience in design of roll grooves and pre-rolled forging blanks acquired during the more than fifty years since AJAX introduced these Rolls into the forge shop.

Die width to accommodate the considerable series of grooves required for abnormally great, cross-sectional reductions or several groups of grooves for blanks with different metal distribution, gives these machines wide general utility.

The advantages accruing in the press forging or drop forging of accurately proportioned, pre-rolled blanks through metal saving, longer die life, greater output and stronger forgings warrant your investigation.

WRITE FOR AJAX BULLETIN 91-A
And Additional Information

THE AJAX MANUFACTURING COMPANY
EUCLID BRANCH P. O. CLEVELAND 17, OHIO
1105 DEARBORN ST. CHICAGO 3, ILLINOIS
DEWART BUILDING NEW LONDON, CONN.

The Fasteners that add EXTRAordinary strength to your product EXTRAordinary speed to its assembly----

Kaufman Cold-Forging Processed

Cleveland High Carbon Heat Treated Cap Screws

● The extra toughness of Cleveland High Carbon Heat Treated Cap Screws adds greater safety to your product; extra precision forming speeds assembly, minimizes rejects. These extra values to you are the result of the Kaufman Double Extrusion Process of cold forging—a method that assures you stronger threaded fasteners than any other known process. It pays you to specify and buy Cleveland High Carbon Heat Treated Cap Screws. The Cleveland Cap Screw Co., 2917 East 79th St., Cleveland 4, Ohio; Warehouses, Chicago and Philadelphia.

Los Angeles 21, 1015 Santa Fe Ave. • San Francisco 5, 50 Hawthorne St. • Seattle 14, 1006 Lowman Bldg.

CLEVELAND *Top Quality* **FASTENERS**

ORIGINATORS OF THE KAUFMAN DOUBLE EXTRUSION PROCESS

Specialists for more than 30 years in

CAP SCREWS, SET SCREWS, MILLED STUDS

Ask your jobber for Cleveland Fasteners

METAL SHOW EXHIBITORS

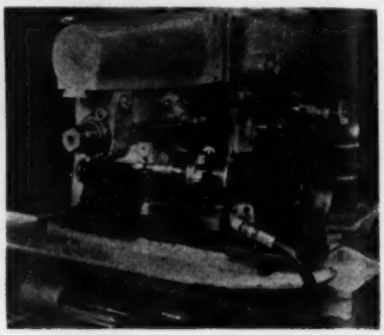
Continued

Electro Alloys Division, American Brake Shoe Co., Elyria, Ohio. Booth 325. Heat and Corrosion resistant castings; furnace parts.

Elgin National Watch Co., Aurora, Ill. Booth 351. Industrial sapphire products; Elgiloy corrosion resistant alloy.

Engineered Castings Div. Booth 325. (See American Brake Shoe Co.)

Erickson Tool Div., Erickson Steel Co., Cleveland 14. Booth 808. Collet chucks and other holding tools.



Erickson speed indexer.

Eutectic Welding Alloys Corp., New York 13. Booth 1703. Welding rods and electrodes.

Fawick Airflex Co., Inc., Cleveland 11. Booth 2537. Industrial clutches and seals.

Ferner Co., R. Y., Boston 48. Booth 548. Scientific instruments; laboratory metallographic equipment.

Ferrotherm Corp., Cleveland 3. Booth 2632. Metal assemblies and springs. Also featuring bright hardening stainless steel.

Foote Mineral Co., Philadelphia 44. Booth 2132. Chemicals and minerals; powder metals and alloys; zirconium.

Forest City Foundries Co., Cleveland. Booth 1108. Gray iron and semisteel castings for agricultural, automotive, electrical and light machinery industries.

Foster Transformer Co., Cincinnati 23. Booth 1025. Welding transformers.

Fulton Foundry & Machine Co., Inc., Cleveland 4. Booth 811. Meehanite irons.

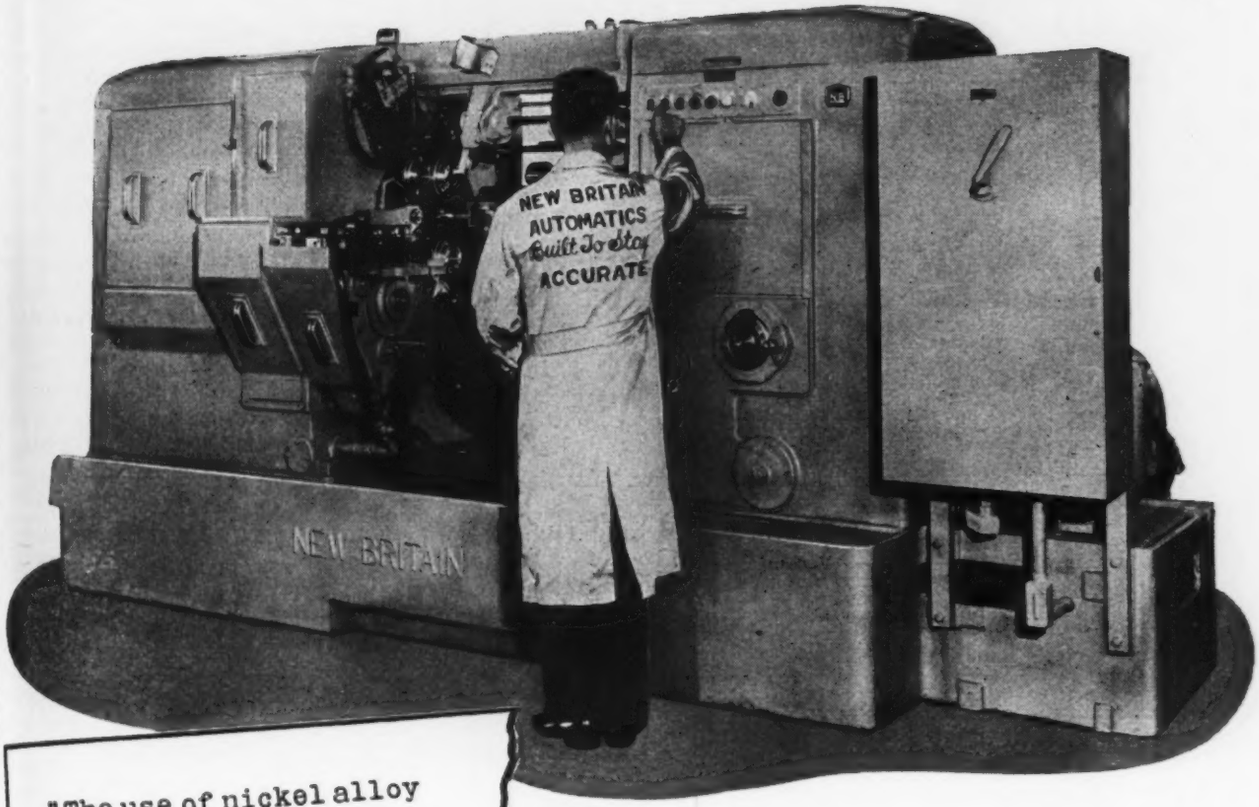
Gas Appliance Service, Inc., Chicago 14. Booth 2735. High-speed heating units; gas-air mixers; burners; air heaters.

Gas Machinery Co., Cleveland 10. Booth 2835. Heat treating equipment; gas producers.

General Alloys Co., Boston 27. Booth 441. Heat and corrosion resistant castings and furnace parts.

HOW NEW BRITAIN AUTOMATICS

Maintain Operating Accuracy



"The use of nickel alloy steels and irons in the construction of these new machines has resulted in an extremely rigid, powerful machine tool with both initial and permanent accuracy."

NEW BRITAIN MACHINE COMPANY

Output soars . . . and costs drop . . . when automatics maintain accuracy at the high machining speeds permitted by carbide tooling. But . . . only extremely rugged machines can utilize carbide-tipped tools to maximum advantage because they demand rigid, heavy mountings . . . steady feed at constant high speeds . . . no backlash in cams, followers, rollers, shafts or gears.

And these essentials can be assured by massive design incorporating nickel alloyed steels and irons, as exemplified by the new automatic screw machine, shown above, built by New Britain-Gridley Division, New Britain Machine Company, New Britain, Conn.

Some 244 parts are produced from nickel-molybdenum steels, heat treated to provide an optimum combination of strength, toughness and wear resistance. In addition, vital cast components are produced in nickel-molybdenum iron to assure good wear resistance and machinability.

For dependable, trouble-free performance specify nickel alloys in *your* equipment. We invite inquiries regarding specific applications.

Don't Forget...

INCO BOOTH NO. 302

Jot down—"INCO Booth, No. 302"—in your memo book of companies to visit at the **NATIONAL METAL EXPOSITION,** at the Public Auditorium in Cleveland, Ohio, October 17th to 21st. Convenient facilities for discussing your problems with our metallurgists and foundry specialists will be available.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N.Y.

Here's just the handy calculator you need for determining the weight of the coils of strip you feed into your automatics.

It's a simple device, like a circular slide rule, which gives you essential data for using Follansbee Cold Rolled Strip and Follansbee Polished Blue Strip in your continuous production lines.

Your Follansbee Coil Weight Calculator is ready for mailing. Just fill out this coupon or write us on your business letterhead.

Follansbee Steel Corp. IA 10-49
Pittsburgh 30, Pa.
I could use a coil weight calculator—

Name_____

Position_____

Company_____

Address_____

FOLLANSBEE STEEL CORPORATION
GENERAL OFFICES, PITTSBURGH 30, PA.
COLD ROLLED STRIP • ELECTRICAL SHEETS • POLISHED BLUE SHEETS
SEAMLESS TERNE ROLL ROOFING
Sales Offices—New York, Philadelphia, Rochester, Cleveland, Detroit, Milwaukee. *Sales Agents*—Chicago, Indianapolis, St. Louis, Kansas City, Nashville, Houston, Los Angeles, San Francisco, Seattle; Toronto and Montreal, Canada. *Plants*—Follansbee, W. Va., and Toronto, Ohio.
Follansbee Metal Warehouses—Pittsburgh, Pa., Rochester, N.Y., and Fairfield, Conn.

METAL SHOW EXHIBITORS

Continued

Geneal Aniline & Film Corp., Johnson City, N. Y. Booth 2427. See Ozalid Div.

General Electric Co., Schenectady 5. Booth 2108. Testing and inspection equipment; welding equipment; furnaces.

Globe Stamping Div., Hupp Motor Car Corp., Cleveland 2. Booth 907. Tumbling barrels; stamped metal parts; machined parts.

Goodrich Co., B. F., Akron, Ohio. Booth 1916. Rivnut blind fasteners.

Gordon Co. of Ohio, Claud S., Chicago 16, Ill. Booth 2744. Temperature control equipment; furnaces.

Gray Iron Founders' Society, Inc., Cleveland 14. Booth 2859. Developments in the gray iron field.

Gulf Oil Corp., Pittsburgh 30. Booth 837. Petroleum products—lubricants, cutting and quenching oils.

H & H Research Co., Detroit 10. Booth 1758. Reciprocating action tools and accessories; surface plates, toolholders.

HPL Manufacturing Co., Cleveland 3. Booth 1825. Metal stampings.

Hamilton Manufacturing Co., Two Rivers, Wis. Booth 2141. Drafting-room equipment.

Hamilton Autoshift drawing table.

Hammond Machinery Builders, Inc., Kalamazoo 54F, Mich. Booth 1142. Polishing, buffing and grinding equipment.

Handy & Harman, New York 7. Booth 337. Brazing equipment.

Harnischfeger Corp., Milwaukee 14. Booth 1806. Arc welders; positioners; handling equipment.

Harper Electric Furnace Corp., Niagara Falls, N. Y. Booth 1106. High-temperature electric furnaces.

Harshaw Chemical Co., Cleveland. Booth 1530. Plating and finishing supplies; chemicals, metallographic equipment and X-ray diffraction equipment.

This "Iron Horse" Has 38,636 Fasteners

It takes 38,636 tough, accurate fasteners of high tensile strength — to match the stress and strain on the framing members of a diesel pulling heavy freight loads.

More than 2,300 bolts . . . 13,800 nuts . . . 21,700 screws . . . 800 rivets furnish the forces that hold modern 4 unit diesel assemblies together.

Because these fasteners have such a vital responsibility, top quality is essential. That's why Russell, Burdsall & Ward for over a century has carried on continuous and intensive research and development work, and has invested consistently in large expansion and improvement programs.

With the price of fasteners such a small part of the total production cost, you'll find it doesn't pay to take chances with fastener quality. For it isn't the initial price but the cost of *using* fasteners that counts.

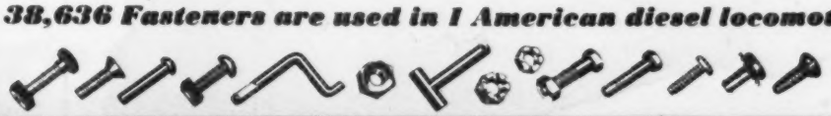
To attain *T*rue *F*astener *E*conomy —save assembly time, eliminate or reduce plant inspection, and get the maximum holding power per dollar of fastener cost with a dependable quality fastener. *T*rue *F*astener *E*conomy contributes to the kind of production savings that puts more and more diesels on U. S. tracks every year. It is this type of contribution to major American industries that explains why — for over 104 years — RB&W has been *making strong the things that make America strong.*

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

RB&W

Plants at: Port Chester, N.Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. Additional sales offices at: Philadelphia, Detroit, Chicago, Chattanooga, Oakland, Portland, Seattle. Distributors from coast to coast.

38,636 Fasteners are used in 1 American diesel locomotive



104 YEARS MAKING STRONG THE THINGS THAT MAKE AMERICA STRONG

HALLDEN
Automatic Shears

CUSTOM BUILT SHEARS FOR ANY APPLICATION

Hallden Automatic Flattening and Cutting Off Machines can be built into lines requiring special shearing applications.

Hallden Automatic Shears are designed to permit continuous feed of metal through the machine by synchronizing the flattener with the flying shear. Cutting accuracy can be held to plus or minus 1/64".

Hallden Shears are self-contained units which, under normal operation, require little maintenance other than lubrication.

Hallden's flexible design allows quick changing of shear knives and easy removal of flattening rolls for grinding. The shear knives always move in a mutual plane.

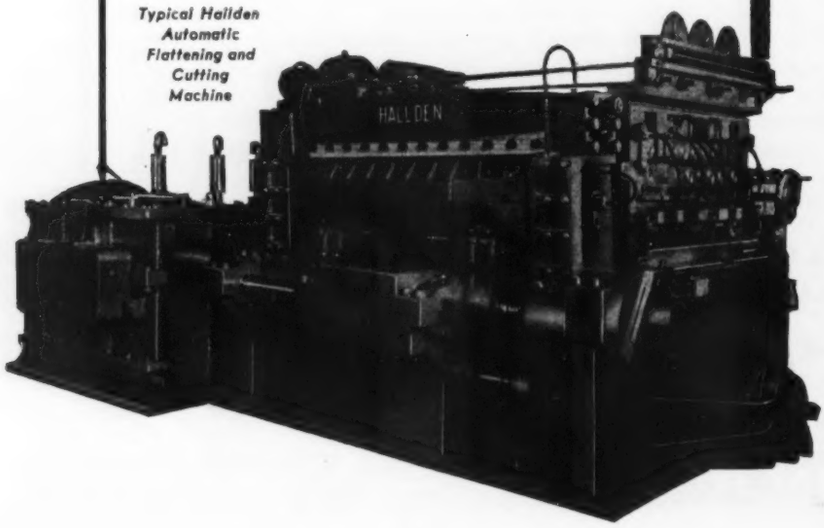
If you have a shearing problem, consult Hallden, *the shearing specialists.*

THE HALLDEN MACHINE COMPANY
THOMASTON, CONNECTICUT

Sales Representatives

The Wean Engineering Co., Inc., Warren, O.
T. E. Dodd, Pittsburgh, Pa.
W. H. A. Robertson & Co., Ltd., Bedford, England

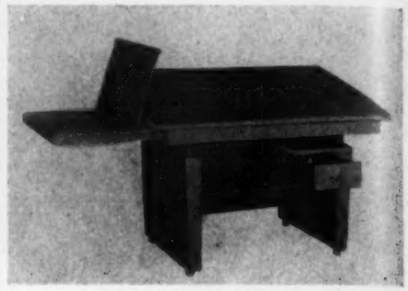
Typical Hallden Automatic Flattening and Cutting Machine



METAL SHOW EXHIBITORS

Continued

Haskell Mfg. Co., Inc., Pittsburgh 21. Booth 2802. Drafting desks.



Haskell work flow drafting desk.

Hauck Manufacturing Co., Brooklyn 15. Booth 2703. Oil burners; valves.

Hayes, Inc., C. I., Providence 5, R. I. Booth 1842. Electric furnaces for heat treating and brazing.

Haynes-Stellite Co., Kokomo, Ind. Booth 1926. High-temperature and corrosion resistant alloys; precision castings; hard facing rods and tools.

Heil Process Equipment Corp., Cleveland 11. Booth 2628. Process tanks; chemical apparatus; chemical-proof construction.

Heppenstall Co., Pittsburgh 1. Booth 1115. Forgings; shear knives; die blocks.

Hevi Duty Electric Co., Milwaukee 1. Booth 509. Electric industrial and laboratory furnaces.

Hobart Brothers Co., Troy, Ohio. Booth 2544. Electric arc welding equipment.

Holcroft & Co., Detroit 10. Booth 2614. Heat treating equipment and supplies.

Hones, Inc., Charles A., Baldwin, L. I., N. Y. Booth 2848. Gas-fired oven furnaces; burners.

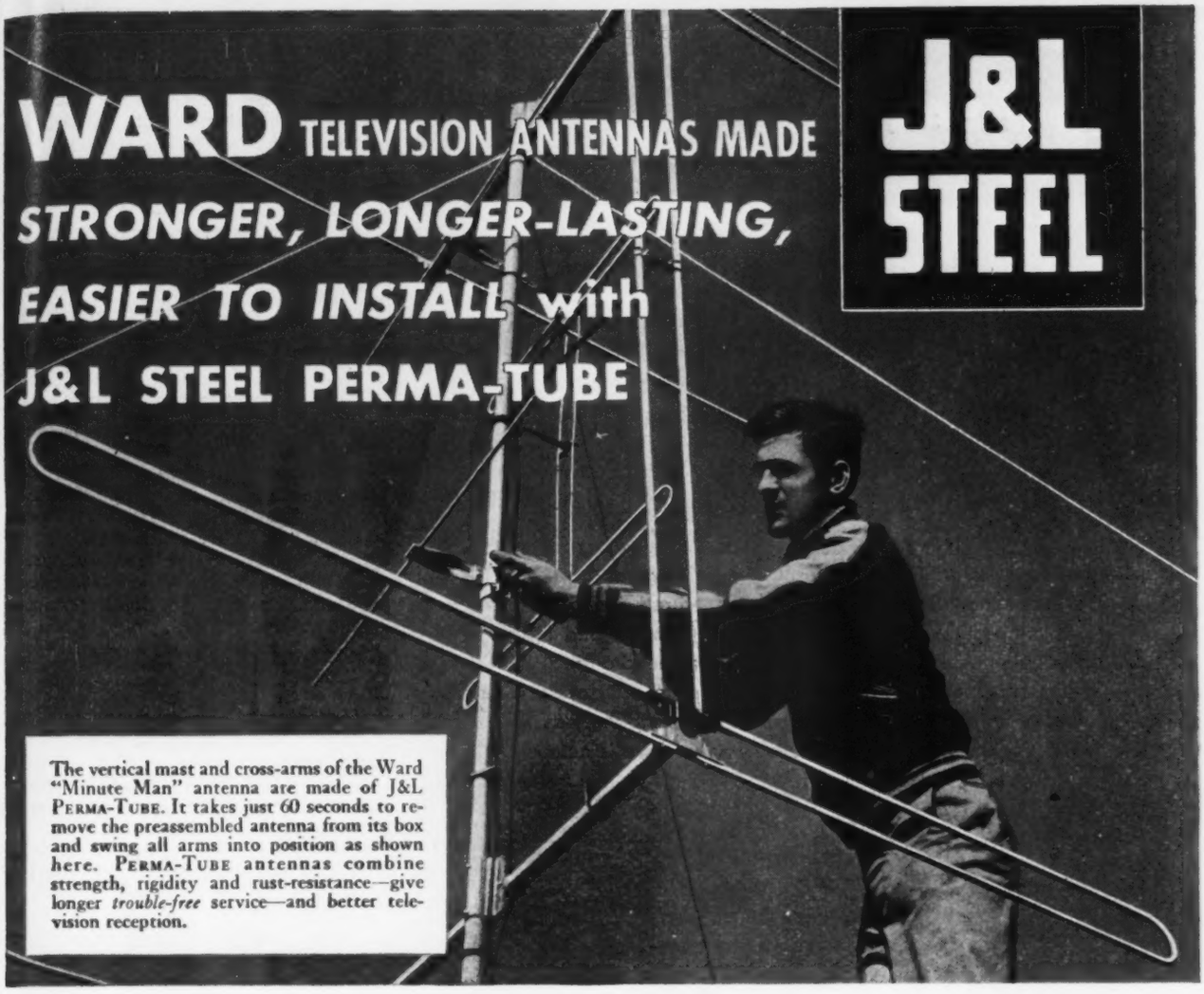
Houghton & Co., E. F., Philadelphia 33. Booth 939. Cutting oils; heat treating compounds; metal cleaners; rust preventatives; lubricants and drawing compounds.

Hupp Corp. Booth 907. (See Globe Stamping Machine Division.)

Illinois Testing Laboratories, Inc., Chicago. Booth 935. Temperature, air and dew point measuring instruments.

Instant Tool Corp., Binghamton, N. Y. Booth 2869. Soldering irons.

Institute of Industrial Launderers, Inc., Cleveland 4, and New York 17. Booth 1757. Industrial wiping towels and garments.


WARD TELEVISION ANTENNAS MADE
STRONGER, LONGER-LASTING,
EASIER TO INSTALL with
J&L STEEL PERMA-TUBE
J&L
STEEL
The vertical mast and cross-arms of the Ward "Minute Man" antenna are made of J&L PERMA-TUBE. It takes just 60 seconds to remove the preassembled antenna from its box and swing all arms into position as shown here. PERMA-TUBE antennas combine strength, rigidity and rust-resistance—give longer *trouble-free* service—and better television reception.

PERMA-TUBE may be used for many applications where strength, rigidity, rust-resistance, and attractive appearance are necessary.

By using the new exclusive rust-resisting J&L PERMA-TUBE for the vertical mast and cross-arms in the "Minute-Man" series of television antennas, Ward Products Corporation, Division of the Gabriel Company, Cleveland, Ohio, builds-in the following advantages:

1. **Greater structural rigidity with smooth, attractive appearance. Greater strength to resist ice loads.**
2. **Clearer, steadier, television reception. Less vibration from wind.**
3. **No mechanical seam in Perma-tube to invite rust which would reduce the torsional strength.**
4. **Ease and speed of installation . . . at less cost.**

J&L PERMA-TUBE is a light-wall, electricweld steel tubing, coated inside and out with an exclusive plastic-type, weather-resistant finish. PERMA-TUBE can be furnished: bent . . . expanded . . . flanged . . . swaged or fluted.

J&L PERMA-TUBE for television antennas, *costs less than any other tubing with comparable strength, rigidity and rust-resistance.*

J&L PERMA-TUBE is not only applicable to television antennas, but also wherever strength, rigidity and rust-resistance are important. It is available in all regular sizes and shapes of J&L Electricweld Tubing and in lengths up to 10 feet. Return the coupon TODAY for complete information on this new J&L product.

Jones & Laughlin Steel Corporation
403 Jones & Laughlin Building
Pittsburgh 19, Pa.

Please send me complete information on the new J&L STEEL PERMA-TUBE mechanical tubing.

Do you recommend PERMA-TUBE for _____?

NAME _____

COMPANY _____

ADDRESS _____

JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L manufactures a full line of carbon steel products, as well as certain products in OTISCOLOY *and* JALLOY (*hi-tensile steels*).

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

A NEW BAR AND TUBE TURNER

✓ . . . automatic centering with roll-type positive, continuous feed

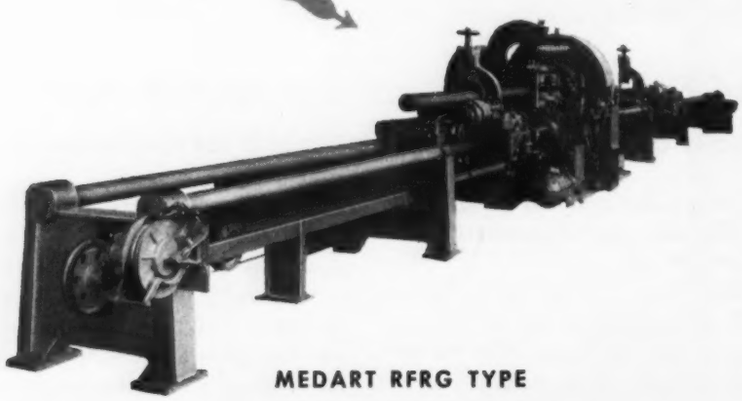
✓ . . . separate drives for cutting tool and bar feed for infinite ratios

✓ . . . two individual automatic-grip carriages

✓ . . . production on rough peel or precision work

✓ . . . 100% chip recovery

The new Medart RFRG type turning machine gives the exact ratio between cutting speed and bar feed rate for superior finish and close tolerance in precision turning, and high production on rough peeling or scalping. Speed and range of materials turned is limited only by the capacity of present day cutting tools. This new machine is completely push-button operated, and its improved, direct drive is actually simpler . . . easier to operate!



MEDART RFRG TYPE

MANUFACTURERS ENGINEERS OF COMPLETE TRANSMISSION EQUIPMENT AND SPECIALIZED MACHINERY

MEDART

THE MEDART COMPANY - 3500 DE KALB ST. ST. LOUIS, MO

METAL SHOW EXHIBITORS

Continued

International Nickel Co., Inc., New York 5. Booth 302. Nickel and nickel alloys; nickel steel and cast iron; stainless steels.

Invincible Vacuum Cleaner Mfg. Co., Dover, Ohio. Booth 2520. Welding flux recovery equipment.

Ipsen Industries, Inc., Rockford, Ill. Booth 2645, Heat treating specialists.

Iron Age, New York 17. Booth 1202. Publications; reprints; technical manuals.

Jackson Products, Warren, Mich. Booth 2660. Electrode holders and arc welding accessories.

Janney Cylinder Co., Philadelphia 36. Booth 2316. Finish-machined products made from centrifugal castings of ferrous and nonferrous alloys.

Jarrell-Ash Co., Boston 16. Booth 1228. Precision scientific apparatus.

Jensen Specialties, Inc., Detroit 28. Booth 2325. Infrared ovens.

Kanthal, AB, Hallstahammar, Sweden. Booth 2666. Heating Equipment.

Kelley Co., J. W., Cleveland 11. Booth 1601. Industrial oils; heat treating products.

Kemp Mfg. Co., C. M., Baltimore 2, Md. Booth 2834. Burners; heating units; control equipment.

Kennametal, Inc., Latrobe, Pa. Booth 520. Tools with brazed-on, screwed-on and clamped-on tips; solid carbide tools; wear resistant parts.

Kent Co., Inc., Rome, N. Y. Booth 2644. Floor machines and suction cleaners.

Kent suction cleaner.

King, Andrew, Narberth, Pa. Booth 244. Portable Brinell hardness tester; folding Brinell microscope.

Kirk & Blum Mfg. Co., Cincinnati. Booth 1938. Weldments.

Knapp Mills, Inc., New York 4. Booth 1708. Chemical and process equipment. Lead-lined products.

Krouse Testing Machine Co., Columbus 3, Ohio. Booth 1514. Rotating beam machines; universal spring fatigue machine; creep rack.

WEIGHED . . . on the run!

With Fairbanks-Morse Belt Conveyor Scales, material can be weighed in transit . . . *automatically.* Installed as an integral part of your belt conveyor system, these accurate units automatically indicate the weight of materials carried by the conveyor belt while in operation and show the accumulated total. There is no need for an extra weighing operation at a remote point to add to handling costs . . . impede material flow. Your Fairbanks-Morse weighing expert will be happy to give you the complete facts on the belt conveyor scale. Fairbanks, Morse & Co., Chicago 5, Ill.

FAIRBANKS-MORSE

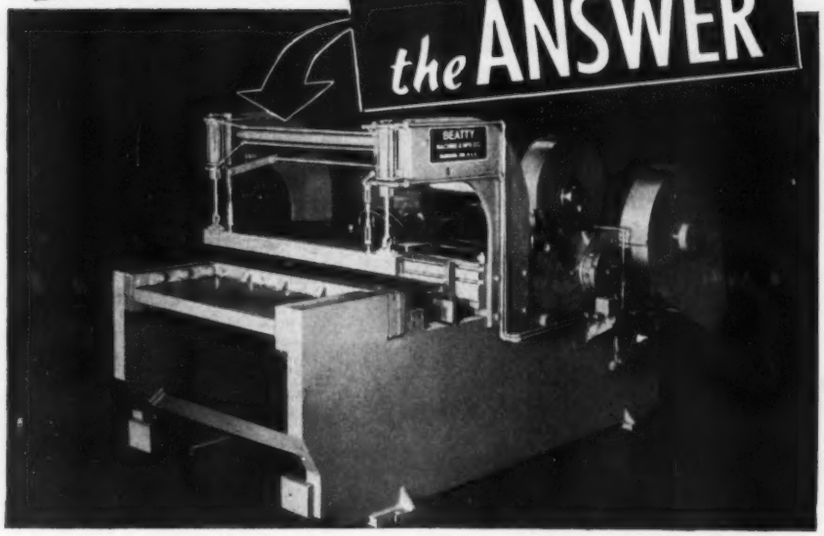
A name worth remembering

DIESEL LOCOMOTIVES • DIESEL ENGINES • PUMPS • SCALES
MOTORS • GENERATORS • STOKERS • RAILROAD MOTOR CARS
and STANDPIPES • FARM EQUIPMENT • MAGNETOS

the PROBLEM

Punching a long line of holes horizontally through a vertical flange after forming.

the ANSWER



NEW HORIZONTAL MULTIPLE PUNCH
SOLVES PUNCHING PROBLEM FOR RAILWAY SHOP

This new Horizontal Multiple Punch, one of the first of its type, is typical of how practical, but imaginative engineering can solve problems. Designed for a railway shop, the new machine punches a series of holes horizontally through a vertical flange, providing for faster, lower cost production, and a more accurate fabrication. An air clamp device holds the material down during the punching operation for gauging purposes. Stripping is accomplished by air cylinders which travel with the ram. If you have a production problem, let a Beatty engineer work with you on it.

Write for full details on the new Horizontal Multiple Punch.

HYDRAULIC HEAVY METAL WORKING EQUIPMENT

BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

METAL SHOW EXHIBITORS

Continued

Kux Machine Co., Chicago 24. Booth 1020. Die casting machines; powder metal press.

Laboratory Equipment Corp., St. Joseph, Mich. Booth 2773. Metallurgical laboratory equipment.

Lake City Malleable Co., Cleveland. Booth 2338. Malleable castings.

Lakeside Steel Improvement Co., Cleveland 14. Booth 232. Commercial heat treating.

Laminated Shim Co., Inc., Glenbrook, Conn. Booth 1128. Brass and steel shim stock.

Lead-Lined Iron Pipe Co., New York 4. Booth 1708. Lead-lined products and process equipment.

Leeds & Northrup Co., Philadelphia 44. Booth 1409. Temperature recorders and controllers; heat treating furnaces.

Lepel High Frequency Laboratories, Inc., New York City. Booth 2102. High frequency induction heating equipment.

Leslie Welding Co., Chicago 12. Booth 1619. Large hand punch presses; ventilators; welding to order.

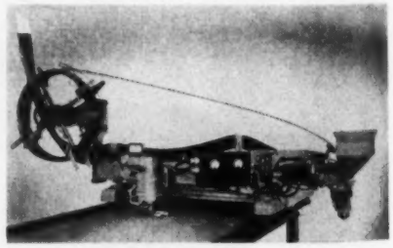
Lewis Machine Co., Cleveland 4. Booth 831. Wire straightening and cutting machinery.

L'Hommedieu & Sons Co., Chas. F., Chicago 23. Booth 2120. Polishing, buffing and plating equipment.

Lincoln Electric Co., Cleveland 1. Booth 410. Arc welding equipment and supplies.

Lindberg Engineering Co., Chicago 12. Booth 1509. Heat treating furnaces and equipment.

Linde Air Products Co., New York 17. Booth 1926. Gas welding and cutting equipment and supplies; Unionmelt; Heliarc.



Unionmelt WM-6 carriage.

Lipe-Rollway Corp., Syracuse 1, N. Y. Booth 1109. Power hacksaw machine.

Liquid Carbonic Corp., Chicago 23. Booth 1116. Gas welding and cutting equipment.

Lithium Co., Newark 4, N. J. Booth 2749. Lithium atmosphere heat treating and forging furnaces.

This is a typical list of manufacturers who, since the end of the war, have purchased Sunbeam STEWART FURNACES to help reduce costs and keep themselves competitive

A Abroff Mfg. Corp.
Acker & Man, Inc.
Adams Construction Co.
Addressograph-Multigraph
Advertising Metal Display
All-Steel Equip. Co.
Allbright-Nell Co.
Allen Bradley Co.
Allen Mfg. Co.
Allis-Chalmers Mfg. Co.
Altorfer Bros. Co.
Aluminum Co. of America
American Air-Filter Co. Inc.
American Airlines Inc.
American Ball Bearing Corp.
American Brake Shoe Co.
American Brush Corp.
American Can Co.
American Cast Iron Pipe Co.
American Chain & Cable Co. Inc.
American Electric Fusion Corp.
American Hardware
Corbin Cabinet Lock Div.
American Hollow Boring Co.
American Instrument Co., Inc.
American Meter Co., Inc.
American Optical Co.
American Phenolic Corp.
Anderson-Carlson Mfg. Co
Anderson Co.
O. L. Anderson Co., Inc.
Apex Smelting Co.
Armstrong Cork Co.
Art-Craft Optical Co., Inc.
Atchison, Topeka & Santa Fe Ry. Co.
Auto Spec. Mfg. Co.
Automatic Electric Co.
Automatic Gas Co. of Columbus, Inc.

B Badger Tool & Eng. Co.
B. A. Ballon & Co., Inc.
The Basick Co.
C. J. Bates & Sons
Bauer & Black Div., Kendall Co.
Bayuk Cigars, Inc.
Beatrice Steel Tank Mfg. Co.
Bell & Gossett Co.
Bell & Howell Co.
Belle City Mfg. Co. Inc.
Bendix Aviation Corp.
L. A. Benson Co. Inc.
Bernardin Bottle Cap Co. Inc.
Blizzard Mfg. Co.
Blue Ridge Pressure Castings
Bolens Products Co.
Bonney Forge Tool Works
Boston Wire Stitcher Co.
James H. Boye Mfg. Co.
Brasco Mfg. Co.
Chas. D. Briddell, Inc.
Bristol Co.
Broderick Co.
D. S. Brown Co.
Bucyrus-Erie Co.
Edw. G. Budd Co.
Buick Oldsmobile Pontiac Assembly
Div., General Motors Corp.
Burgess-Norton Mfg. Co.
Burndy Eng. Co. Inc.

C Caine Steel Co.
Cameron Mfg. Corp.
Carbo Tool & Die Co.
Carnegie-Illinois Steel Corp.
Certain-Teed Prod. Corp.
W. M. Chace Co.
Chain Belt Co.
Chamberlain Corp.
Cherry-Burrell Corp.
Chicago Auto Spring Co.
Chicago & North Western Ry. Co.
Chicago Pneumatic Tool Co.
Chicago Rawhide Mfg. Co.
Chicago, Rock Island & Pacific RR Co.
Chicago Screw Co.
Chicago, South Shore & South Bend RR
Chopie Tool & Die Co.
Chrysler Corp.
W. M. Cissell Mfg. Co.
Clayson-Forenz Co.
Clifton Conduit Co.
Colgate Mfg. Corp.
Collyer Insulated Wire Co., Inc.
Corn Products Refining Co.
Cummins Business Machines
Cutler-Hammer, Inc.

D Davis & Furber Mach. Co.
Day Brite Lighting, Inc.
Deere & Co.
Detroit Gear Div., Borg-Warner Corp.
Detroit Stamping Co.
Diamond Expansion Bolt Co., Inc.
Doehler-Jarvis Corp.
Dole Valve Co.
E. I. DuPont de Nemours & Co., Inc.
Dynamatic Corp.

E Eagle Pencil Co. Inc.
Eastman Machine Co.
Eclipse Sleep Products, Inc.
Ehlert Tool Eng. Co.
Electric Storage Battery Co.
Emerson Electric Mfg. Co.
Essex Wire Corp.
Chicago Transformer Div.
R-B-M Div.
Eveready Tool Co.
Eversharp, Inc.

F Fafnir Bearing Co.
Ferrara Spring & Parts Co., Inc.
Fischer & Porter Co.
Michael Flynn Mfg. Co.
Foreman Mfg. Co.
Frazer & Jones Co.

G General Cable Corp.
General Electric Co.
General Motors Corp.
Electro-Motive Div.,
Frigidaire Div.
General Tool & Die Corp.
Geroter May Corp.
Gibson Refrigerator Co.
Girard Mfg. Co.
Gisholt Machine Co.
Great Lakes Spring Corp.
Green Bay Drop Forge Co.

H Hammond Brass Works
Harrington & King Perforating Co.
Hartford Machine Screw Co.
J. F. Helmhold & Bro.
Hi Level Screw Prod. Co.
High Speed Hammer Co. Inc.
Hotpoint, Inc.
Houdaille-Hershey Corp.
General Spring Bumper Div.
Huntington Div.
Oakes North Chicago Div.
M. D. Hubbard Spring Co.
B. H. Hubbert & Son, Inc.
Hummer Mfg. Co.
Hy-Pro Tool Co., Inc.
Hydraulic Press Mfg. Co.

I- Illinois Tool Works
International Projector Corp.
J International Tool & Gauge Co.
James Mfg. Co.
Johnston Lawn Mower Corp.
Jones & Laughlin Steel Corp.
A. D. Joslin Mfg. Co.

K Kent Galvanizing Co.
Kewanee Mach. & Conveyor Co.
Klein Mfg. Co.
Kraeuter & Co., Inc.
Kropp Forge Co.

L L-S Mfg. Co.
A. Lakin & Sons
Landis Machine Co.
Leach Co.
Ledkote Products Co.
Leman Machine Co.
Line Material Co.
Link Belt Co.
Lloyd Mfg. Co.
Lobdell-Emery Mfg. Co.
Locke Insulator Corp.
Louden Machinery Co.
Lux Clock Mfg. Co.

M Macey Co., Div. Earle S. Irwin Co.
Magnetics, Inc.
Malleable Industries
Manganese Steel Forge Co. Inc.
Manufacturers Machine & Tool Co.
Marathon Elec. Mfg. Co.
McGraw Electric Co.
McHenry Mfg. Co.
Mid-States Steel & Wire Co.
Midwest Brass Forging Co.
Milford Metal Treating Co.
Milford Plastic Tool Corp.
Minneapolis-Honeywell Regulator Co.
Modine Mfg. Co.
Mojonnier Bros. Co.
Monarch Marking System Co.
Mossberg Pressed Steel Corp.
Chas. Mundt & Sons

N Nachman Corp
Nash-Kelvinator Corp.
National Elec. Welding Machine Co.
National Enameling & Stamping
National Pressure Cooker Co.
National Rivet & Mfg. Co.
New Jersey Instrument Corp.
New Monarch Machine & Stamping Co
Newark Stove Co.
Northern Electric Co.
Northern Pacific Railway Co.
Northwest Metal Prod. Inc.

O- Ohio Brass Co.
Oliver Corp.
P Pacific States C. I. Pipe Co.
Paramount Wedding Ring Co.
Pearlduck, Inc.
Peerless Roll Leaf Co. Inc
Penn Rivet & Machine Co.
Petersen Mfg. Co.
Phelps Dodge Corp.
Philco Corp.
Pick Mfg. Co.
H. K. Porter Co.
American-Fort Pitt Spring Div.
Precision Mfg. Co
Progressive Mfg. Co.

R Radio Corp. of America
R. J. Randel Tool Co.
Manhattan Rubber Mfg. Div. of
Raybestos-Manhattan, Inc.
F. B. Redington Co.
W. H. Reisner Mfg. Co. Inc.
Reliable Electric Co.
Remington Rand, Inc.
Republic Steel Corp.
Rewelec Mfg. Co.
Rheem Mfg. Co.
Richardson Scale Co.
Richmond, Fredericksburg & Potomac
RR Co.
Roy E. Roth Co.
Wm. & Harvey Rowland, Inc.
Royal Typewriter Co.
Ruud Mfg. Co.
Jos. T. Ryerson, Inc.

S Safety Socket Screw Co.
Sager Lock Works
Schultz Die Casting Co.
Scovill Mfg. Co.
Seneca Wire & Mfg. Co.
Servel, Inc.
W. A. Shaeffer Pen Co.
Shepard Niles Crane & Hoist Corp
R. H. Sheppard Co. Inc.
A. O. Smith Corp.
Solomon Sokoloff
South Bend Lathe Works
Sperti Faraday, Inc.
St. Joe Machines, Inc.
St. Louis Southwestern Ry. Co.
St. Louis Steel Castings Co.
Staatsburg Ice Tool Works
Standard Dredging Corp.
Standard Shade Roller Corp.
Standard Steel Spring Co.
Steel Fabricating & Engineering Co.
Stewart Die Casting Div.
Stockham Pipe Fittings Co.
Sylvania Industrial Corp.

T Tait Mfg. Co.
Tennessee Coal, Iron & R. R. Co.
Texas Co.
Thomas & Skinner Steel Products Co.
Tillotson Mfg. Co.
Timken Roller Bearing Co.
Tobin Tool & Die Co.
Townsend Co.
Triangle Auto Spring Corp.
Triplett Electrical Instrument Co.
Tube Turns, Inc.

U- U. S. Cloth Cutting Mach. Co.
V U. S. Metals Products
United-Carr Fastener Corp.
Universal Chain Co. Inc.
Universal Oil-Seal Co.
Ushco Mfg. Co., Inc.
Vince Forging & Mfg. Co.
Vollrath Non-Ferrous Metal Foundry

W Waterloo, Cedar Falls &
Northern RR
Watson Elevator Co. Inc.
Waukesha Motor Co.
Weaver Mfg. Co.
Webster Electric Co.
Western Electric Co., Inc.
Wetmore Reamer Co.
Wisconsin Knife Works
John Wood Mfg. Co., Inc.
Woodring & Wise Machine Shop

Y- Yale & Towne Mfg. Co.
Z Ypsilanti Reed Furniture Co.
Zenith Radio Corp.

Sunbeam
STEWART INDUSTRIAL FURNACES
A DIVISION OF Sunbeam CORPORATION

(Formerly CHICAGO FLEXIBLE SHAFT CO.)

Main Office: Dept. 110, 4433 Ogden Ave., Chicago 23

New York: 322 W. 48th St. Detroit: 3049 E. Grand Blvd.

Canada Factory: 321 Weston Rd., So., Toronto 9

A letter, wire or 'phone call will promptly bring you information and details on SUNBEAM STEWART furnaces, either units for which plans are now ready or units especially designed to meet your needs. Or, if you prefer, a SUNBEAM STEWART engineer will be glad to call and discuss your heat treating problems with you.

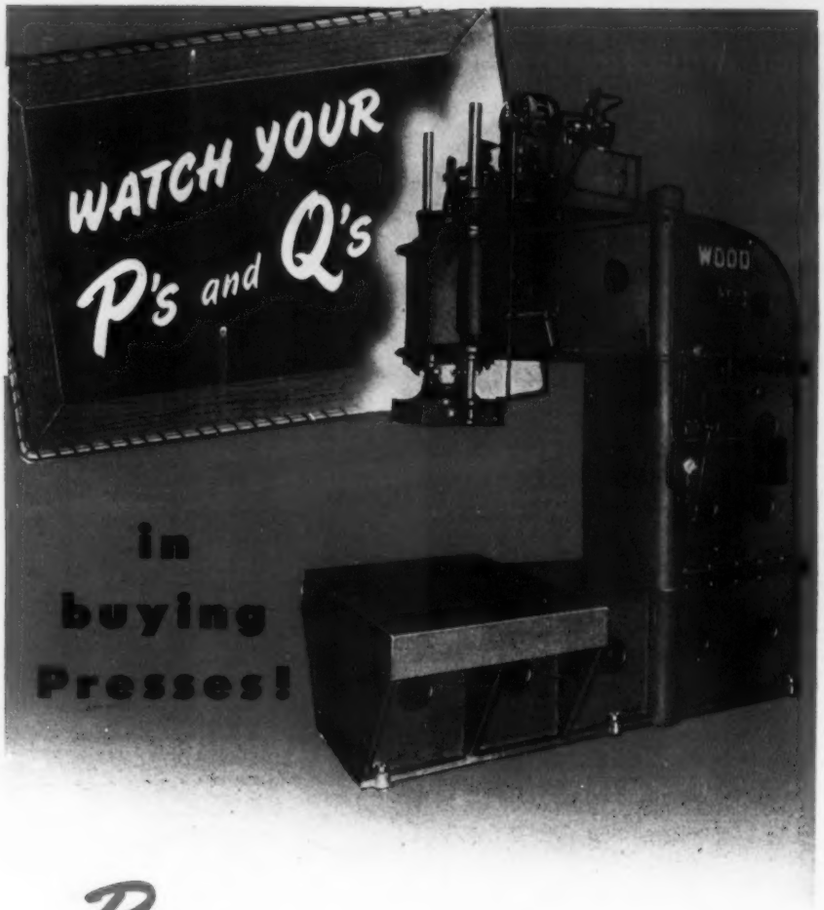
Mail this coupon for complete information on furnaces to meet your needs:

- ☐ Atmosphere-controlled
- ☐ Bonderizing
- ☐ Brazing furnace
- ☐ Car bottom
- ☐ Case hardening
- ☐ Combination
- ☐ Complete toolroom
- ☐ Continuous production heat treat line
- ☐ Electric high speed
- ☐ Electric pre-heat
- ☐ Forging
- ☐ Galvanizing
- ☐ Gas carburizing
- ☐ Gas nitriding
- ☐ High speed steel
- ☐ Metal melting
- ☐ Oven
- ☐ Pot
- ☐ Recirculating
- ☐ Rivet heaters
- ☐ Rotary hearth forge
- ☐ Soldering iron heaters
- ☐ Tempering
- ☐ Tool hardening

Name _____ Title _____

Company _____

Address _____



PROOF:

You want proof that the press you buy will give you maximum quality production with maximum economy. Take the R. D. Wood 250-ton Hydro Lectric Open-Gap Press shown, for example. Used in flanging, bending, or straightening operations, this press has proved itself in countless plants throughout the country. It does a quality job, keeps operating and maintenance costs at a minimum.

Q. E. D.:

You want a press that demonstrates its worth to you. You'll find such worth inherent in R. D. Wood Presses. In the design, materials, and workmanship which go into the R. D. Wood Press line lies your assurance of demonstrable production and economy. Write now for data on hydraulic presses or hydraulic press problems. R. D. WOOD COMPANY, Public Ledger Building, Phila. 5, Pa.

HYDRAULIC PRESSES AND VALVES FOR [illegible] • ACCUMULATORS • [illegible] • INTENSIFIERS

EST. 1803

R.D. Wood Company

PUBLIC LEDGER BUILDING, PHILADELPHIA 5, PA.

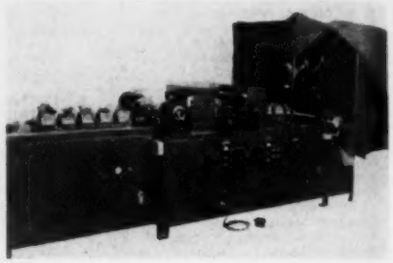
METAL SHOW EXHIBITORS

Continued

Lukens Steel Co., Coatesville, Pa. Booth 503. Steel plate; clad steels.

Lukenweld Division, Lukens Steel Co., Coatesville, Pa. Booth 503. Nickel-clad, monel-clad and inconel-clad steels.

Magnaflux Corp., Chicago 31. Booth 1015. Magnetic flaw detection equipment; thickness gage.



MAL-3 Magnaflux inspection unit.

Magnetic Analysis Corp., Long Island City 1, N. Y. Booth 1119. Magnetic inspection equipment; comparators.

Magnetrode Corp., Kansas City, Mo. Booth 2825. Welding.

Malleable Founders Society, Cleveland. Booth 2041. Malleable iron information and applications.

Manhattan Rubber Division, Raybestos-Manhattan, Inc., Passaic, N. J. Booth 2320. Abrasive disks; grinding and cutting wheels.

Martindale Electric Co., Cleveland 7. Booth 2656. Grinding and filing equipment; saws; dust masks.

Master Builders Company, Cleveland 3. Booth 1765. Concrete and masonry; industrial floors; grouting cement.

May-Fran Engineering, Inc., Cleveland 12. Booth 1130. Materials handling equipment.

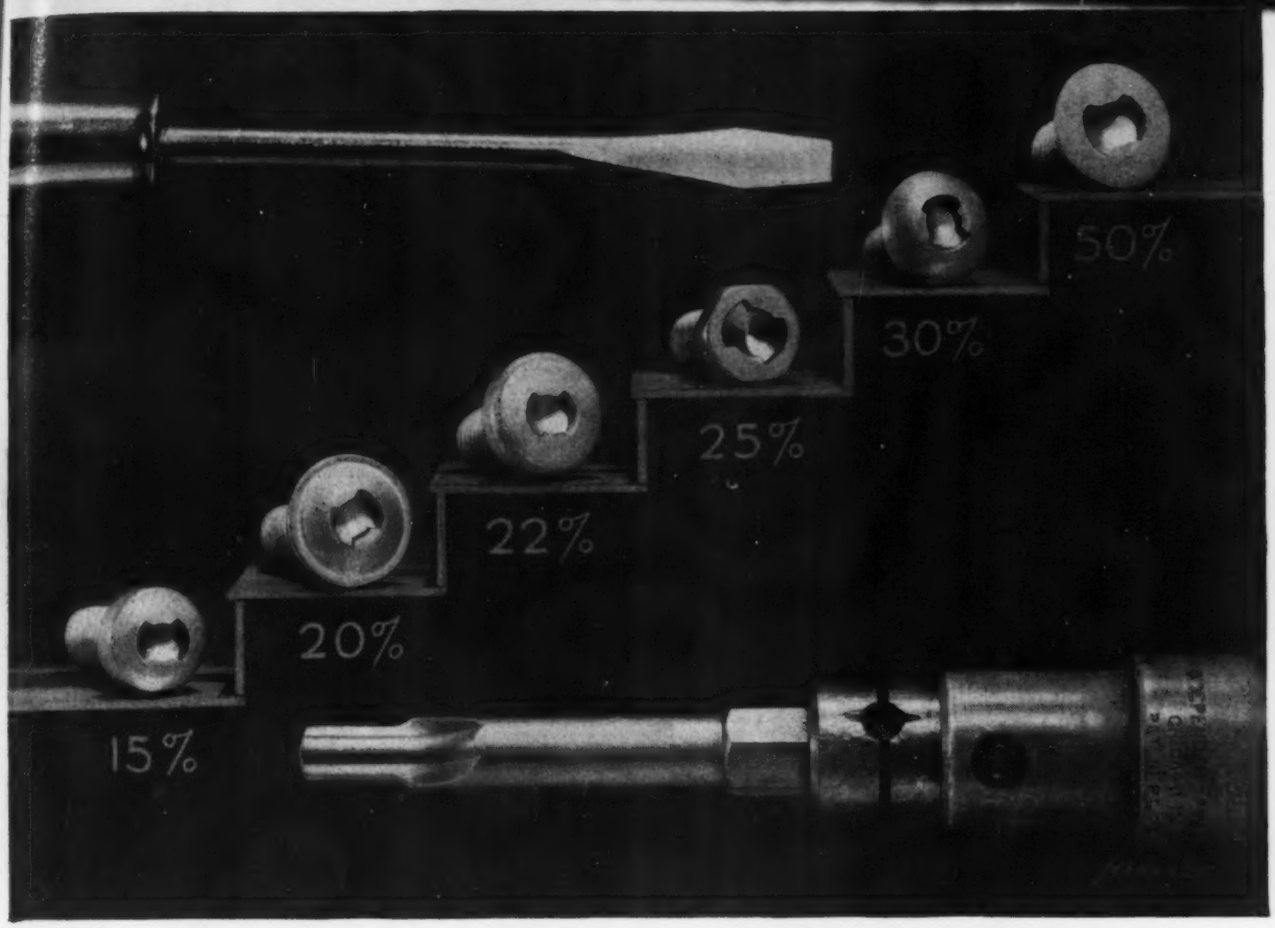
Merrill Brothers, Maspeth, N. Y. Booth 1771. Drop forgings, shackles, eye-bolts.

Metal & Thermit Corp., New York 5. Booth 1935. Arc welding electrodes; welding accessories and welding machines.

Michiana Products Corp., Michigan City, Ind. Booth 237. Stainless, heat resistant and abrasion resistant and abrasion resistant castings.

Milburn Co., Detroit 7. Booth 2863. Protective hand creams; safety clothing.

Miller Electric Mfg. Co., Appleton, Wis. Booth 2526. Electric welders and accessories.



The Percentage Is All in Your Favor

These production increases are from the records of assembly lines where change-over was made from *other* types of *recessed head screws* to CLUTCH HEAD

HERE'S HOW CLUTCH HEAD PAYS OFF IN GAINS AND SAVINGS

High visibility of the recess cancels out slow-down hesitation . . . confident operators logically drive more screws.
Center Pivot entry prevents driver canting, insures straight driving . . . saves cost and delay of "fixing" burred or chewed-up heads.
Non-tapered driving engagement reduces skid hazard to zero . . . protects manpower and saves costly damage to materials.
All-square contact means no "ride-out" (as set up by tapered driving) . . . no fatiguing end pressure needed to combat "bucking."
The CLUTCH HEAD Lock-On hurdles "fumble spots" on the line . . . unites screw and bit as a unit for one-handed reaching and driving.
The rugged Type "A" Assembly Bit for unmatched tool economy . . . drives up to 214,000 screws non-stop on a high torque job.
Check the extra profit stemming from this steady production flow . . . no time-wasting stoppages for frequent tool changing.
Repeatable reconditioning multiplies the life of this bit . . . only a 60-second application of the end surface to a grinding wheel.
This simple operation restores original efficiency, *time and time again* . . . no expense or bother of back-to-the-factory shipments.
Consider the value of simplified field service . . . with a recess basically designed for common screwdriver operation.
Your service men and customers save time on field adjustments . . . any flat blade reasonably accurate in width will do.

These exclusive time and money-saving features are fully described and illustrated in the new CLUTCH HEAD *brochure. Send for your copy, mentioning the sizes and types of screws, standard or special, that interest you . . . to come by mail and without obligation.*

CLUTCH HEAD SCREWS

UNITED SCREW AND BOLT CORPORATION

CLEVELAND 2 CHICAGO 8 NEW YORK 7

TO FORM **Quality** TUBES, PIPE AND COLD ROLLED SHAPES

USE ARDCOR ROLLER DIES!

Continuous precision and quality of cold rolled products depends upon your roller dies!

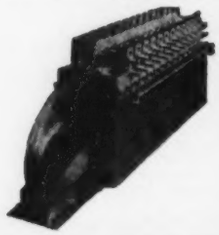
With correctly designed ARDCOR Roller Dies, made of highest grade tool steel, maximum production speeds are assured . . . better products obtained.

ARDCOR Craftsmen have the ability to serve, the experience to guide and the facilities to produce.

ARDCOR * ROLL FORMING MACHINES

* Formerly McKinsey—WITH ARDCOR IMPROVEMENTS

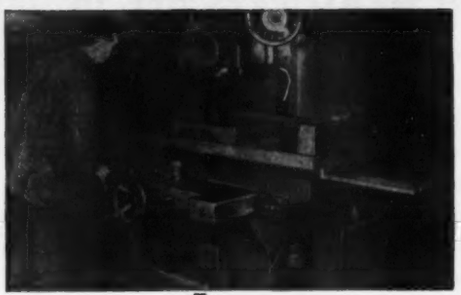
WRITE FOR THE NEW ARDCOR CATALOG, *TODAY!*



AMERICAN ROLLER DIE CORPORATION

20650 St. Clair Ave. CLEVELAND 17, OHIO

E*nthusiastic Customers* do our BEST advertising



True Temper Corporation, manufacturers of True Temper Products, use fourteen Grand Rapids Hydraulic Feed Surface Grinders in ten of their factories. The machine shown is a Model 55A.

You will appreciate the micro-inch finish produced at production speeds on Grand Rapids Grinders. All Grand Rapids Hydraulic Feed Surface Grinders have these outstanding features:

1. One-piece column and base casting for vibrationless rigidity
2. Precision ball-bearing spindle which is greased for life
3. Bijur one-shot lubrication system eliminating hand oiling
4. Patented vertical movement of wheel head for quick, accurate adjustments
5. Portable coolant tank for ease of coolant replacement
6. Vane type hydraulic pump for fast longitudinal table travel

To serve you—

Your inquiry concerning your specific grinding needs will receive prompt attention. Grand Rapids Grinders include: Hydraulic Feed Surface Grinders, Universal Cutter and Tool Grinders, Hand Feed Surface Grinders, Drill Grinders, Tap Grinders, and Combination Tap and Drill Grinders.

GALLMEYER & LIVINGSTON COMPANY

200 Straight, S. W., Grand Rapids 4, Mich.

GRAND RAPIDS GRINDERS

METAL SHOW EXHIBITORS

Continued

Miller Co., J. G., Grand Rapids 4, Mich. Booth 2341. Buffing compounds; electroplating and polishing equipment and supplies.

Milne & Co., A., New York 14. Booth 314. Steel distributors.

Mir-O-Col Alloy Co., Los Angeles 31. Booth 1120. Hard facing metals; ferro-alloy castings.

Miskella Infra-Red Co., Cleveland 4. Booth 814. Infrared ovens and appliances.

Moto-Truc Co., Cleveland 3. Booth 2208. Motorized hand trucks.

National Bearing Div. Booth 325. (See American Brake Shoe Co.)

National Carbon Co., Inc., New York 17. Booth 1926. Graphite electrodes; carbon refractories and molds; heat exchangers.

National Diamond Laboratory, New York 7. Booth 2707. Industrial diamond tools.

National Lead Co., New York 6. Booth 2559. Lead primary products and end products.

National Radiator Co., Johnstown, Pa. Booth 1510. (See Plastic Metals Div.)

National Research Corp., Boston 15. Booth 2662. Vacuum-cast metals; high-vacuum furnaces and equipment.

National Spectrographic Labs., Inc., Cleveland 3. Booth 1228. Spectrographic equipment and supplies.

Nelson Stud Welding Div., Morton Gregory Corp., Lorain, Ohio. Booth 2230. Stud welders.

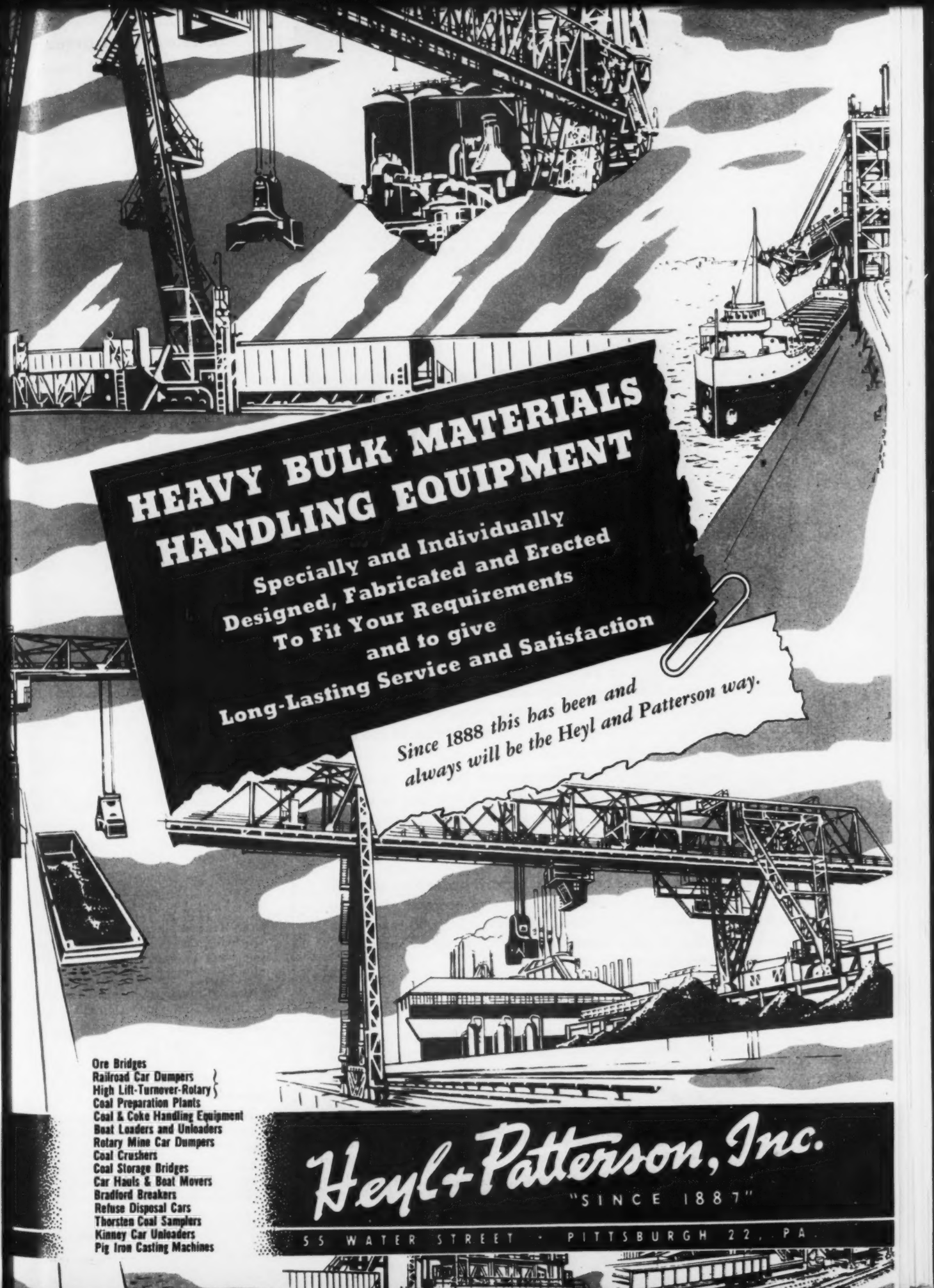
New Jersey Zinc Co., New York 7. Booth 415. Zinc die castings; metal powder parts and finished products.

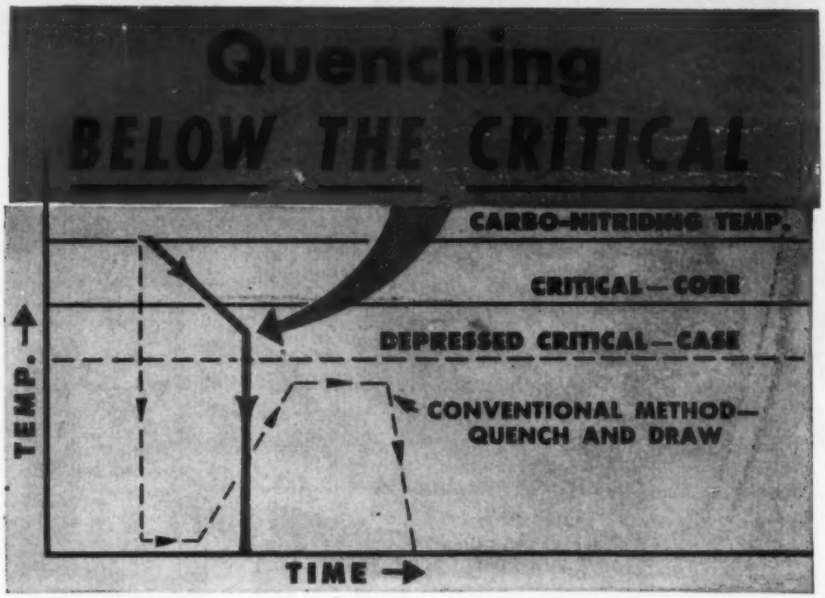
Zinc diecastings on Oldsmobile.

Nickel Plate Railroad, Cleveland. Booth 225. Industrial promotion.

North American Mfg. Co., Cleveland 5. Booth 1136. Gas burner systems.

North American Phillips Co., Mt. Vernon, N. Y. Booth 832. Diffraction equipment and cameras; X-ray spectrometers.


HEAVY BULK MATERIALS HANDLING EQUIPMENT
Specially and Individually Designed, Fabricated and Erected To Fit Your Requirements and to give
Long-Lasting Service and Satisfaction
Since 1888 this has been and always will be the Heyl and Patterson way.
Ore Bridges
Railroad Car Dumpers
High Lift-Turnover-Rotary
Coal Preparation Plants
Coal & Coke Handling Equipment
Boat Loaders and Unloaders
Rotary Mine Car Dumpers
Coal Crushers
Coal Storage Bridges
Car Hauls & Boat Movers
Bradford Breakers
Refuse Disposal Cars
Thorsten Coal Samplers
Kinney Car Unloaders
Pig Iron Casting Machines
Heyl & Patterson, Inc.
"SINCE 1887"
55 WATER STREET · PITTSBURGH 22, PA.



A *NEW* CASE-HARDENING TECHNIQUE WHICH

- Eliminates the Draw Furnace
- Gives File-Hard Case and Soft, Tough Core
- Cuts Distortion to a New Low
- Saves Time, Money and Floor Space

THIS NEW Holcroft process provides a carbo-nitrided case of superior wear resistance and a soft, tough core of maximum impact resistance—*without a draw.*

The work (plain carbon or alloy steel) is heated in a controlled atmosphere composed of generator gas, hydrocarbon gas and ammonia. Besides increasing the hardness, addition of nitrogen (from the ammonia) depresses the critical temperature of the case below the critical (Ar_1) of the core.

When the desired depth of case is obtained, the work is moved into an atmosphere cooling zone, where it is brought to a temperature *below* the critical of the core and *above* the critical of the case. The work is then quenched from this temperature, as illustrated.

Since the core is quenched below its critical, it undergoes no hardening, and distortion is negligible. The case, however, is made file-hard—more wear-resistant than a straight carburized case. Thus a superior quality of work is obtained, at worth-while savings in time, money and floor space.

This is one more example of Holcroft trail-blazing in heat-treat work of all kinds. This leadership in applied metallurgy is one reason why Holcroft furnaces—individually designed for specific applications—provide unsurpassed quality at lower cost in *every* high-production application. We invite your inquiries.

SINCE 1916 **Holcroft AND COMPANY**

BUILT BY HOLCROFT & COMPANY DETROIT-MICH.

PRODUCTION HEAT TREAT FURNACES FOR EVERY PURPOSE

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C. H. MARTIN, A. A. ENGELHARDT
1017 PEOPLES GAS BLDG.

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WALKER METAL PRODUCTS, LTD.
WALKERVILLE, ONTARIO

HOUSTON 1
R. E. McARDLE
5724 NAVIGATION BLVD.

METAL SHOW EXHIBITORS

Continued

Oakite Products, Inc., New York. Booth 2565. Cleaning compounds and materials; steam cleaning equipment; rust and scale removers.

Ohio Crankshaft Co., Tocco Div., Cleveland 1. Booth 537. High-frequency induction heating equipment.

Ohio Seamless Tube Co., Shelby, Ohio. Booth 1032. Seamless and electric welded steel tubing.

Olsen Testing Machine Co., Tinius, Willow Grove, Pa. Booth 1830. Universal and tensile testing machines; small tools and instruments.

O'Neil-Irwin Mfg. Co., Lake City, Minn. Booth 451. Sheet metal working machinery.

Optimus Equipment Co., Matawan, N. J. Booth 1737. Washing, rinsing, pickling and drying equipment.

Osborn Manufacturing Co., Cleveland 14. Booth 817. Power and hand brushes.

Ozalid Div., General Aniline and Film Corp., Johnson City, N. Y. Booth 2427. Printing, developing and drafting equipment.

Pangborn Corp., Hagerstown, Md. Booth 1715. Hydro-Finish blast cleaning machine.

Park Chemical Co., Detroit 4. Booth 544. Heat treating materials.

Partlow Corp., New Hartford, N. Y. Booth 2418. Temperature controls; recorders; thermometers; valves and timers.

Permanente Products Co., Oakland 12, Calif. Booth 1205. Applications of aluminum sheet, plate, coil and shapes.

Peters-Dalton, Inc., Detroit 12. Booth 536. Dust collectors; spray booths.

Phillips Manufacturing Co., Chicago 45. Booth 1629. Vapor degreasers.

Physicists Research Co., Ann Arbor, Mich. Booth 1420. Surface analysis equipment.

Plastic Metals Division, National Radiator Co., Johnstown, Pa. Booth 1510. Metal powders and parts.

Porter-McLeod Machine Tool Co., Inc., Hatfield, Mass. Booth 1745. Polishing and finishing machines; abrasive cut-off machines.

Precision Metalsmiths, Inc., Cleveland 3. Booth 2515. Precision castings.

Precision Shapes, Inc., Suffern, N. Y. Booth 2771. Milling shapes.

Precision Tube Co., Philadelphia 28. Booth 2867. Small nonferrous metal tubing.

Precision Welder and Machine Co., Cincinnati 10. Booth 1817. Resistance welding machines.

Preston Co., Horace G., Detroit 16. Booth 1128. Packing; gaskets; valves; washers.

UNEQUALED FOR HIGH RATIO, HIGH SPEED DRIVES..

WHERE GEAR SIZES MUST BE KEPT TO A MINIMUM

HYPOID GEARS are the ideal combination for power transmission between shafts at *any angle and speed*. Actually, the unsurpassed performance of Hypoids result largely from the curvature and obliquity of teeth—assuring continuous pitch line contact and an overlapping action, which allows at least two pairs of teeth in contact at all times—smooth transfer of load from tooth to tooth (without noise and vibration) and increased load carrying capacity, due to the distribution of load over a greater number of teeth.

HYPOID GEARS are similar to spiral-bevels, but have pinion axis offset above or below center of gear axis. Gear and pinion shafts of a Hypoid pair can continue past each other . . . this direct and compact arrangement is used to advantage in steel mill, paper mill, and printing plant machinery, etc. Other advantages are: more room to place bearings on both sides of gear and pinion, and in some cases, lowered or raised position of the pinion, allowing arrangements of machinery which would otherwise be impossible.

Send for the "Gear Book," which contains 68 pages of highly useful information; in fact, it's almost a "treatise on gears." Please use your Business Letterhead when writing for this Catalog.

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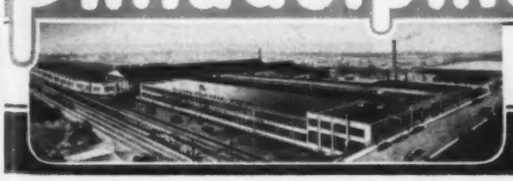

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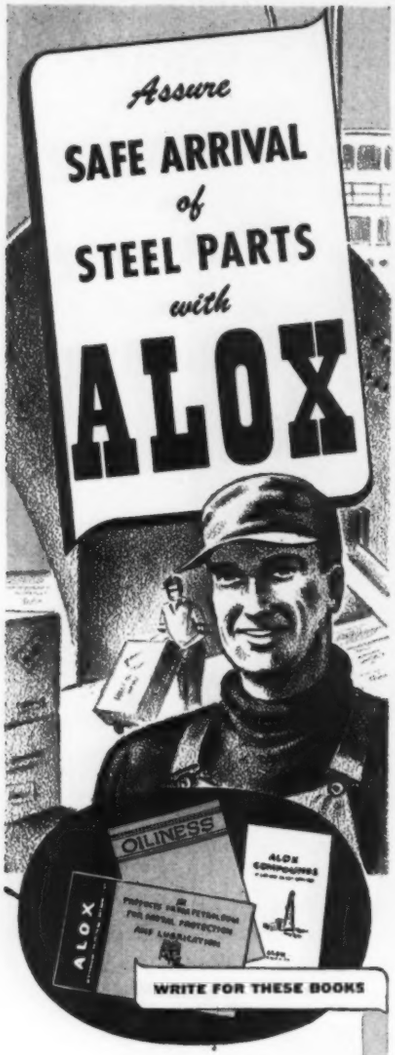
LimiTorque Valve Controls



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● Insist on the use of ALOX 388-940-707 inhibitors for the maximum protection of steel parts during fabrication, assembly, storage and shipment.

Successfully used to protect overseas shipment of war equipment during World War II. Today these film forming rust preventives containing ALOX inhibitors are used in the control of corrosion of farm and construction equipment.

Write for literature on ALOX *products and where to buy the rust preventives containing* ALOX

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METAL SHOW EXHIBITORS

Continued

Production Machine Co., Greenfield, Mass. Booth 926. Polishing, buffing and deburring machines.

Pyrometer Instrument Co., Inc., Bergenfield, N. J. Booth 1626. Optical, radiation and immersion pyrometers.

Pyrometer Service & Supply Co. Booth 2744. (See Gordon, Claud S. of Ohio.)

Ransom & Randolph Co., Toledo 1. Booth 2568. Dental alloys; supplies.

Ransome Machinery Co., Dunellen, N. J. Booth 1019. (See Worthington Pump & Machinery Corp.)

Rapids-Standard Co., Grand Rapids, Mich. Booth 1702. Materials handling equipment; conveyers; hand trucks.

Raybestos-Manhattan, Inc. (See Manhattan Rubber Division.)

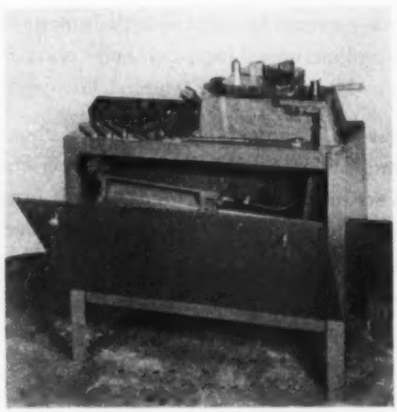
Reed Roller Bit Co. Booth 2562. (See Cleco Division.)

Reeves Pulley Co., Columbus, Ind. Booth 1519. Pulleys and belts in metalworking and plant equipment.

Revere Copper & Brass, Inc., New York 17. Booth 1003. Applications of Revere metal, copper and brass, aluminum.

Reynolds Metals Co., Louisville 1, Ky. Booth 1412. Aluminum primary products and end products.

Richards Co., J. A., Kalamazoo 60F, Mich. Booth 1126. Bending and cutting machines.

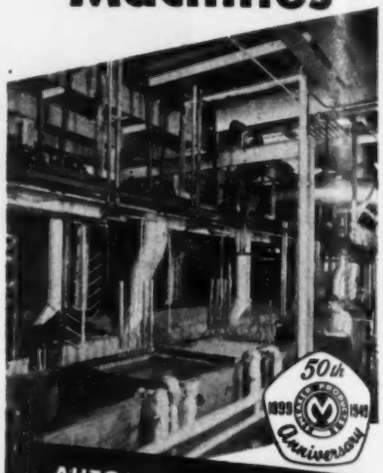


Richards air-operated bender.

Riehle Testing Machine Div., East Moline, Ill. Booth 1709. Tensile, impact, hardness and other mechanical testing machines.

Riverside Metal Co., Riverside, N. J. Booth 2231. Nickel silver; phosphor bronze; beryllium copper; cupronickel.

MEAKER Electroplating Machines



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for mass production of
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For supplementary capacity
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For any special plating
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Equipment tailored to fit your requirements, making every operation in the plating sequence automatic, or as mechanized as possible, is the profitable way to handle electroplating on a production basis. This Meaker method applies equally well to departments with only moderate daily output and to the largest and heaviest plating needs of the mass production plants. It offers not only a lower unit cost, but the production is increased, and a better and more uniform quality is assured.

Write for the full information. Ask for Booklet 148

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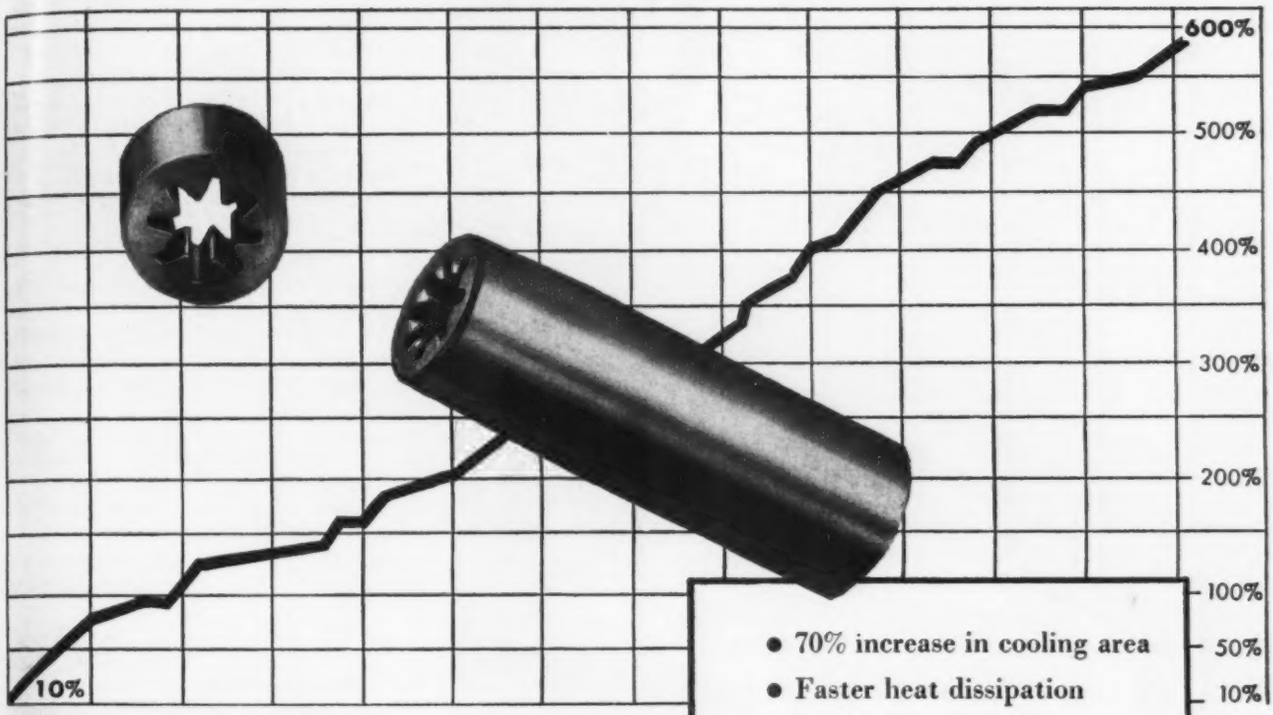
Telephone CRawford 7-7202

Where Do You Fit In This Picture?



- 70% increase in cooling area
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Actual customer field experiences with the Mallory Fluted Tips have demonstrated life increases of from **10%** to **600%.**

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METAL SHOW EXHIBITORS

Continued

Rolock, Inc., Fairfield, Conn. Booth 820. Fabricated heat and corrosion resistant alloys for furnace parts; metalworking trades.

Ruemelin Mfg. Co., Milwaukee 12. Booth 2615. Sand blasting equipment.

Ryerson & Son, Inc., Joseph T., Chicago 80. Booth 411. Alloy steels.

Safety Clothing & Equipment Co., Cleveland 3. Booth 1515. Protective clothing and safety equipment.

St. Regis Sales Corp., Cleveland. Booth 2815. Wire tying equipment and supplies.

Salkover Metal Processing, Cincinnati 2. Booth 1520. Brazing and soldering techniques.

Sandvik Steel, Inc., New York 11. Booth 512. Quality steels.

Schrader's Son Div., A., Brooklyn 17. Booth 2335. Pneumatic machine controls.

Scovill Manufacturing Co., Waterbury 91, Conn. Booth 1220. High speed brass rod.

Selas Corp. of America, Philadelphia. Booth 2841. Heating furnaces and burners.

Sellers Engineering Co., Chicago, Ill. Booth 2837. Gas burners and heaters.

Sentry Company, Foxboro, Mass. Booth 1131. Hardening furnace; tube combustion furnace; diamond blocks and accessories.

Service Machine Co., Elizabeth, N. J. Booth 2856. Presses.

Shell Oil Company, Inc., New York 20. Booth 1731. Industrial lubricants; cutting oils; drawing compounds.

Socony-Vacuum Oil Co., Inc., New York 4. and Cleveland 15. Booth 2619. Cutting and grinding oils; lubricants.

South Bend Lathe Works, South Bend 22, Ind. Booth 807. Lathes; drill presses, shapers.

Spencer Turbine Co., Hartford 6, Conn. Booth 2735. Vacuum cleaning equipment; turbo compressors.

Sperry Products, Inc., Danbury, Conn. Booth 1920. Ultrasonic instruments for detection of flaws and measuring thickness.

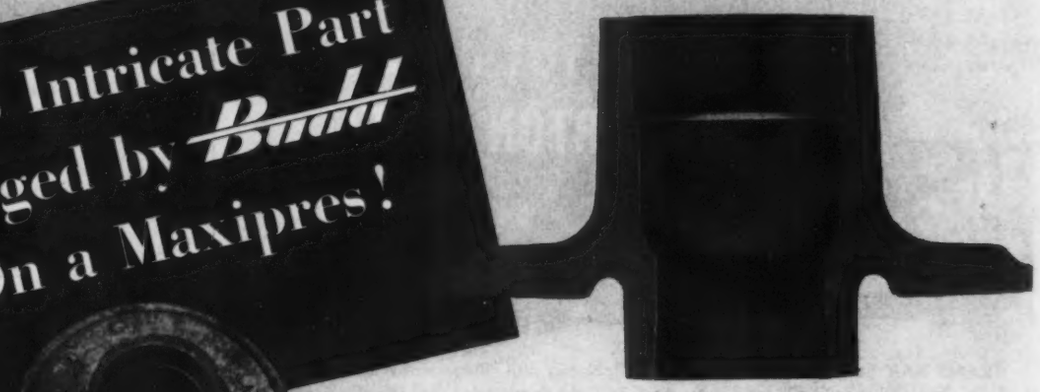
Standard Alloy Company, Cleveland 10. Booth 915. Heat resisting furnace parts.

Standard Electric Tool Co., Cincinnati 4. Booth 1628. Grinding, buffing and polishing equipment.

Standard Oil Co. of Ohio, Cleveland 15. Booth 1800. Cutting, drawing, grinding and honing lubricants.

Sterling Tool Products Co., Chicago 22. Booth 2720. Portable sanding machines.

This Intricate Part Forged by Budd On a Maxipres!



CUT-AWAY VIEW OF FORGING

TRIMMED FORGING

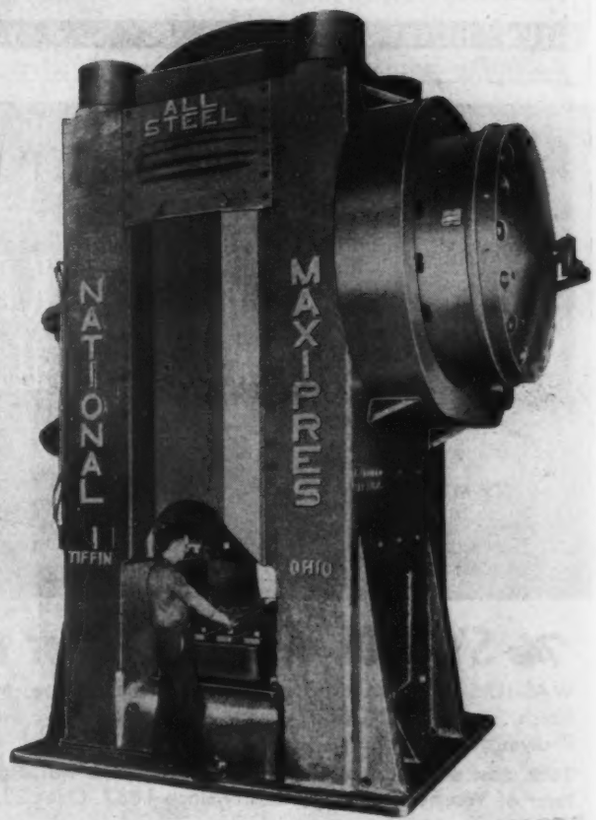
SLUG

FLASH

The automobile wheel hub illustrated above is forged by The Budd Company, Wheel Division, Detroit, Michigan, on a National No. 6-A MAXIPRES.

The blank for this intricate forging weighs six pounds, four ounces; with only four ounces of stock lost in the form of the flash ring and center slug.

Here is another example of how MAXIPRESSES are used to produce superior forgings at lower cost.



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Gas or diesel, 12 to 37 ft. booms or adjustable telescopic booms; solid or pneumatic rubber tires. Buckets, magnets, and other accessories available.

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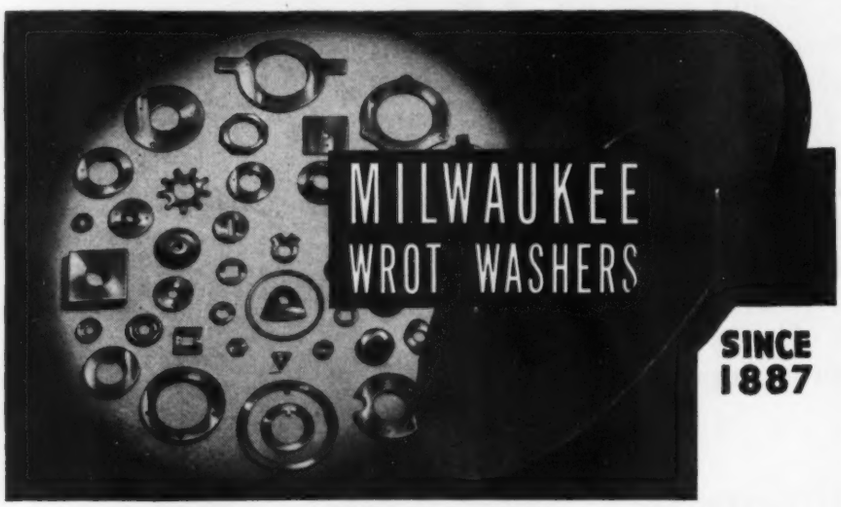

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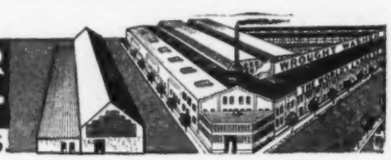

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METAL SHOW EXHIBITORS

Continued

Stimpson Co., Inc., Edwin B., Brooklyn 5. Booth 2207. Screw machine parts; eyelets; rivets; snap fasteners; stampings.

Stokes Machine Co., F. J., Philadelphia 20. Booth 2040. Powder metal presses.

Stone Machinery Co., Inc., Syracuse, N. Y. Booth 2201. Metal cut-off machines.

Stuart Oil Co., Ltd., D. A., Chicago 23. Booth 426. Cutting and grinding oils.

Sun Oil Company, Philadelphia 3. Booth 1725. Petroleum products for the metalworking industry.

Superior Carbon Products, Inc., Cleveland 5. Booth 233. Carbon, graphite and metal-graphite brushes for generators and motors.

Superior Foundry, Inc., Cleveland. Booth 218. Castings.

Superior Tube Co., Norristown, Pa. Booth 2527. Small tubing of many metals.

Surface Combustion Corp., Toledo 1, Ohio. Booth 517. Heat treating furnaces and equipment.

Tempil Corporation, New York 11. Booth 525. Temperature-indicating crayons, pellets and paint.

Tennant Co., G. H., Minneapolis 11. Booth 1525. Floor cleaning and maintenance machines.

Texas Co., New York 17. Booth 2415. Cutting coolants and lubricants.

Tide Water Associated Oil Co., New York 4. Booth 2821. Industrial lubricants; cutting oils.

Timken Roller Bearing Co., Canton 6, Ohio. Booth 943. Seamless steel tubing; steel products.

Tin Research Institute, Inc., Columbus 1, Ohio. Booth 1502. Tin products; research publications.

Tinnerman Products, Inc., Cleveland 13. Booth 238. Speed Nuts and Speed Clips.

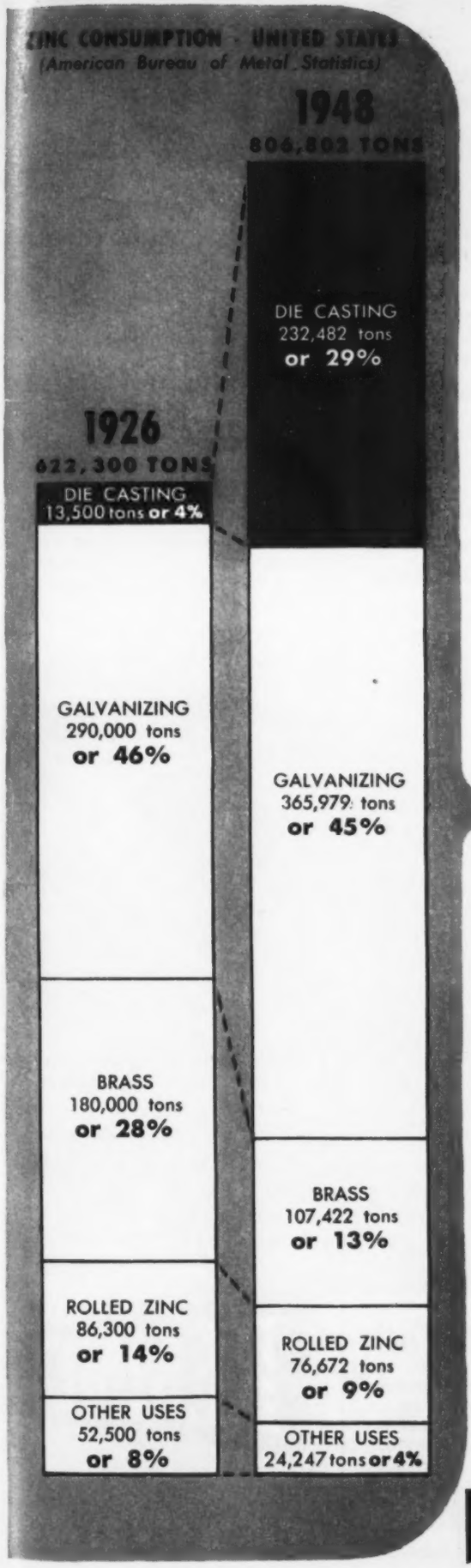
Titanium Alloy Mfg. Div., Niagara Falls, N. Y. Booth 1112. Titanium alloys and products; refractories.

Tomkins-Johnson Co., Jackson, Mich. Booth 2216. Metalworking tools and equipment.

Torrington Mfg. Co., Torrington, Conn. Booth 1103. Spring coilers; metal slitting machines.

Towmotor Corporation, Cleveland 10. Booth 2545. Lift trucks and accessories for materials handling.

Turco Products, Inc., Los Angeles 11, Calif. Booth 1406. Industrial chemicals; cleaning compounds.



DIE CASTING

ZINC "rings the bell"

The growing importance of die casting as a high-speed, low-cost production tool is accurately mirrored in the industry's emergence within a relatively short span of years, as the country's second largest consumer of zinc—the preferred base metal of the industry. In view of its present rank as a user of zinc, it is noteworthy that up until 1925, the American Bureau of Metal Statistics, in its tables on the consumption of zinc by industries, did not even mention the die casting industry as a consumer. Instead, the annual tonnages of zinc used in die casting alloys were included under the heading of "other uses." The chart on the left shows that in 1926, the first year in which figures were reported, only 13,500 tons or 4% of the total tonnage of zinc consumed in the United States were used in die casting alloys. In 1948 these figures had risen to 232,482 tons or 29% of the total.

The phenomenal growth of the die casting industry is a success story which was "plotted" in the laboratories of Bunker Hill, where the production of 99.99+% zinc was first developed from the status of a metallurgical curiosity into a commercial reality. It is significant to note that the most rapid rise took place after 1928 which was the year in which Bunker Hill 99.99+% zinc was first introduced into the market.

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BUNKER HILL 99.99+% ZINC

METAL SHOW EXHIBITORS

Continued

Uddeholm Co. of America, Inc., New York 17. Booth 205. Swedish steels; toolsteels.

Udylite Corp., Detroit 11, Mich. Booth 425. Plating and polishing equipment.

Union Carbide & Carbon Corp., New York 17. Booth 1926. (See National Carbon Co., Haynes Stellite Co., Linde Air Products Co.)

U. S. Hoffman Machinery Corp., New York. Booth 2332. Industrial cleaning, maintenance equipment.

U. S. Reduction Co., East Chicago, Ind. Booth 1751. Aluminum alloy ingots; aluminum fluxes.

Universal Cyclops Steel Corp., Bridgeville, Pa. Booth 2215. Toolsteels; stainless and special steels.

Upton Electric Furnace Div., Commerce Pattern Foundry & Machine Co., Detroit, Mich. Booth 2015. Industrial furnaces; salt baths.

Vanadium-Alloys Steel Co., Latrobe, Pa. Booth 1401. Toolsteels.

Vanadium Corp. of America, New York 17. Booth 914. Vanadium alloys, metals and chemicals.

Vapor Blast Mfg. Co., Milwaukee 9. Booth 1831. Liquid honing equipment.

Wagner Rustproofing Co., Cleveland. Booth 2830. Rustproofing equipment.

Wall Chemical Division, Chicago. Booth 1116. (See Liquid Carbonic Corp.)

Wall Colmonoy Corporation, Detroit 3. Booth 508. Hard facing alloys.

Wells Mfg. Corp., Three Rivers, Mich. Booth 1908. Band saw machines.

Wells & Sons, W. F., Three Rivers, Mich. Booth 2002. Metal cutting band saws.

Wells, Inc., Martin, Los Angeles. Booth 2518. Electrodes and electrode holders.

Westinghouse Electric Corp., Pittsburgh 30. Booth 2026. New rectifier type DC welder; automatic welding heads; phos-copper electrodes; resistance welding control equipment; Mototrol electronic control equipment; new X-ray thickness gage.

Wheelco Instruments Co., Chicago 7. Booth 2226. Temperature measurement, recording and control instruments.

Wilson Mechanical Instrument Co., New York 17. Booth 925. (Associated with American Chain and Cable) Rockwell hardness testers; Tukon tester; Knoop indenter.

Worthington Pump & Machinery Corp., Harrison, N. J. Booth 1019. Welding and assembly positioning equipment.

Wright, Wilbur J., Lakewood, Ohio. Booth 1128. Manufacturers agent.

Resume Your Reading on Page 80

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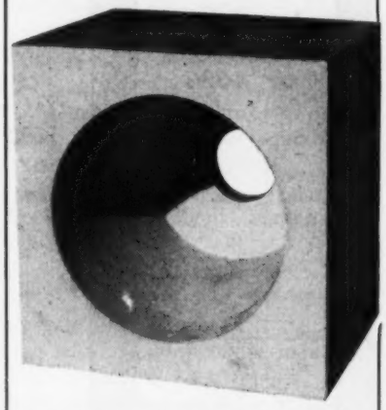
PYROMETRIC CONE EQUIVALENT #38



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. . . well, maybe not to the layman, but to the fabricator of Fired or Unfired Pressure Vessels, it *seems* like one . . . especially when it meets exacting specifications; when it is accurate and uniform; when it is a product *rigidly controlled* (from pouring the ingot to finished head); when the fabricator knows that the steel and workmanship are of the highest quality — and finally, when he is *absolutely confident* that it will do the job well. Yes, these factors make even a prosaic *Steel Head* "*a thing of beauty*" to the fabricator.

Worth also makes: Flue Holes, Handholes, Manholes, Saddles and Fittings; Stainless Clad Steel Plate — and large diameter Expanded Fusion Welded Steel Pipe.

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Giving Outstanding Service in Metallurgical Laboratories FROM COAST TO COAST
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The acid test for any product is how it stands up in service. Here is what leading metallurgists in the iron and steel industries say about McDanel Porcelain Combustion Tubes and Zirco Tubes: "Highly satisfactory in every respect"—"Never spall or blister"—"We run 8 to 10,000 carbon and sulphur analyses a month with seldom a failure".
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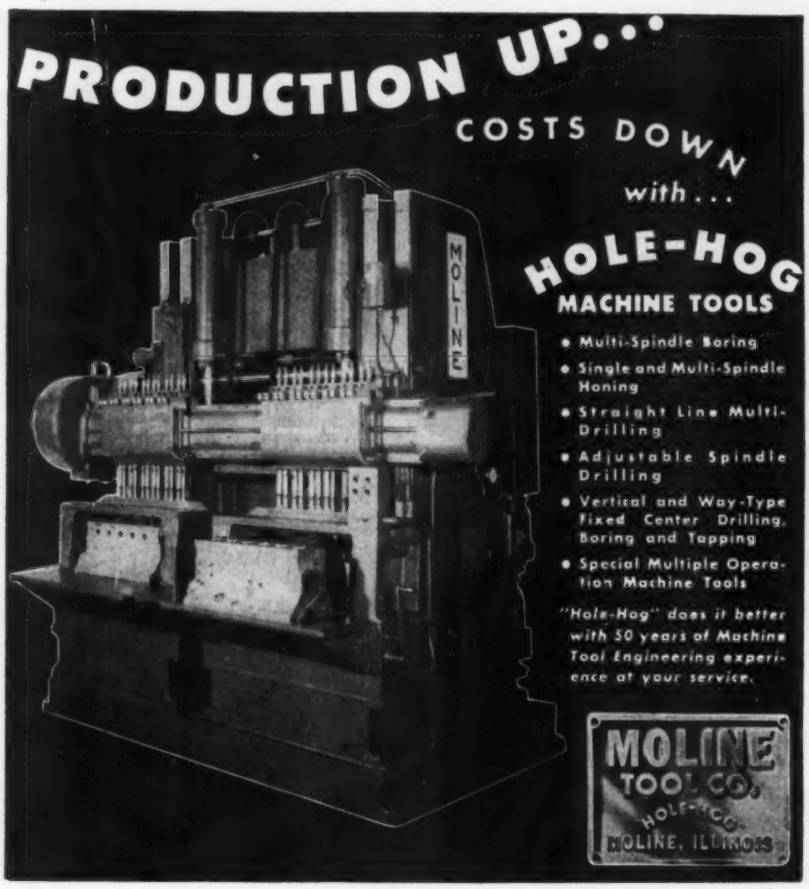
Beaver Falls . . . Penna.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Canadian Steel Demand Requires Capacity Production

Toronto—Demand for iron and steel in Canada is being maintained at a high level and mills are maintaining capacity production. Large orders for steel in various classifications are pending which assure a brisk market for several months into the future.

Included in large projects for which steel will be required is the oil pipelines from Edmonton to Regina in Alberta and from Edmonton to Superior, Wis., representing an expenditure of $90 million. The total length of the proposed pipelines is 790 miles, and for the line from Edmonton to Regina, a total of 450 miles, the contract for steel has been let to the Steel Co. of Canada to produce pipe made by Page-Hersey, Ltd., at Welland.

The pipeline is to be completed by the fall of 1950 and the one to Superior late in 1951. Consumers' Gas Co., Toronto, will require large tonnage of steel for a new gas holder and also may be faced with heavy expenditure for gas pipe line to bring natural gas from the U. S. border to Toronto. Toronto Transportation Commission has started its new underground system for which thousands of tons of steel will be required, and in addition several large hydroelectric projects are planned for early construction.

Authorizes Industrial Items

Washington — Recent Marshall Plan authorizations amounted to $130 million and brought the cumulative total as of Sept. 19 to nearly $6.7 billion.

Currently, authorizations are primarily industrial items, the proportion running as high as 80 pct. Some of the larger authorizations included:

Italy, $2.5 million for industrial machinery; Bizone Germany, $2.7 million for industrial machinery; and Greece, $1.1 million for generators and motors.

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10"x36" Landis Hydraulic M.D.
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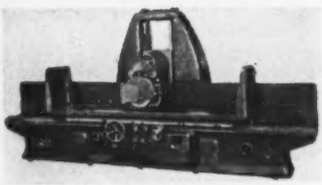
6"x18" Landis Type C Hydraulic M.D.
10"x24" Landis

AND MANY OTHERS

SURFACE GRINDERS



20"x36"x16' Mattison, Late Type M.D.
18"x24"x96" Mattison, Late Type M.D.
Thompson 8"x24", M.D.
12" Pratt & Whitney Vertical
No. 34 Abrasive Vertical, 8"x24"
No. 33 Abrasive Vertical, 7½"x22"
6"x18" Norton Hyd. Vertical

AND MANY OTHERS

GRINDERS, SPECIAL

72" Hanchett Rotary Surface—1942
Poole Roll Grinder, 22"x126", M.D.
Lempco Crankshaft, 30"x96", M.D.
#2, 3, Cincinnati, Centerless, M.D.
#2 Cincinnati, Tool & Cutter, M.D.
#16-C-16" Bryant Hyd. Int. M.D.
#5A Bryant Semi-Auto. M.D.
Bridgeport Knife Grinders 8'6"x13" M.D.
72" Knife Grinder M.D.
Roterex Grinder
22" Pratt & Whitney Vert.

AND MANY OTHERS

THREAD MILLERS

Lees-Br. 24"x54" Sp. hole 13" M.D.
Pratt & Whitney 10"x60" M.D.
Hanson Whitney 10"x24" M.D.
Hanson Whitney 7½"x11½" M.D. Univ.
Lees-Br. #40 Prod. Ch. 1942, M.D.

AND MANY OTHERS

BROACHES

4L Lapointe, 1942—XA-4 Oilgear
V-2-12 American Vert.
No. 2—36 Cinn. Single Ram, 1942

AND MANY OTHERS

MILLERS — PLAIN UNIV. VERT.

No. 5 Milwaukee Pl., 1943
No. 5 Cincinnati Pl., 1943
No. 4H Milwaukee Pl.
No. 4 Cincinnati Pl. 1940
#2 & 3B B&S Plain 1943
No. 36 Van Norman 1943
No. 4 Cincinnati Univ. Rect.
No. 22-L Van Norman
No. 2A & 3A B&S Universal
No. 2 Cincinnati Univ. 1942
No. 4 Cincinnati Vertical H.P.
No. 4 Cincinnati Vertical 1944
#2 Cinn. Vert. 1943
9-J Gorton Vertical Miller
U.S. Multi Millers
#000 Brown & Sharpe
24" Cincinnati, Automatic Milling Machine
18" Cincinnati, Production 1942
#3, #2 S. P. Van Norman 1943
#22 LU., Van Norman, 1942 Complete

AND MANY OTHERS

HEADERS

#5 W. F. Toggle S.S.-S.D. ⅞"
National ¾"
#362 Pawtucket ⅝"
#22 W.F. ⅜" 1940
5/16" W.F. Open die D. St.
#1 W.F. 3/16" D. St.

AND MANY OTHERS

ROLLS

No. 7 Hilles & Jones 25'x⅝"
Cleveland Drop End 20'x1"
Cleveland 10'x1"
10'x12 ga. Hendley & Whitemore
Wysong & Miles 62"x5/32"
No. 3 Hilles & Jones 8' Straightening
5 Head Rafter Duplex Forming M.D.
6 Head Bliss Forming
Jane & Roach, Forming

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PLANTS WANTED

We are interested in purchasing several metal working plants . . . in operation or inactive.

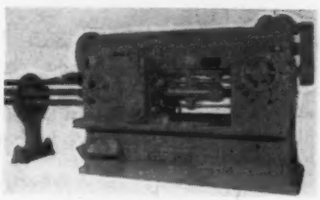
All offerings held in strictest confidence.

SHAPERS

32" Ohio Univ.
32", 28", 24", 20" G & E, M.D.
24", 20", 16" Cincinnati, Univ. M.D.
24" Rockford Hyd.

AND MANY OTHERS

AUTOMATICS



5" 5 Sp. Conomatic—Timken Bearing
#2G Brown & Sharpe, L.T.
NEW #0G B&S, L.T.
#61 New Britain 6 Sp. 1942
#60 New Britain 6 Sp. 1943
1⅝" 5 Sp. Acme Gridley
1⅝" 4 Sp. Acme Gridley
1" 4 spindle Acme Gridley
2" 4 spindle Conomatic 1940
2⅝" 4 Sp. Conomatic
20" x 25" Fay, 1942
3¾" Cleveland single spindle 1942
Fas-e-matic 4F 24"

AND MANY OTHERS

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½ B x 50" P & W, 2 Sp. Deep, Hole Reamer
½ B x 50" P & W, 10 Sp. Gun Barrel Chambering
Monarch Auto Sizing Control
30" Lysholm Plate Table
#281 Adriance Slitter 34"x24 ga.
Braddock Slitter 38"x20 ga.
#30 W.F. Thread Roller, hopper
Newton Slotters 36", 34", 32", 30", 24", 20", 18", 14", 12", 10"
6 Sp. Acme Nut Tapper ½" to 1½"
#2, #1 Bakewell Tappers
Spot Welders 74, 66, 350 KVA's
Ex-Cell-O #212A Bore-o-matic
#45 Heald Bore-o-matic
Jones & Lamson Bench Optical Comparator
Fellow Gear Lapper
Fellow Gear Burnishing Machine
Modern Cut-Off Machine

AND MANY OTHERS

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Brakes	Shears
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Riveters	Nibblers
Slitters	Saws
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Profilers	Saline Millers
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Sterling WOOD HANDLE
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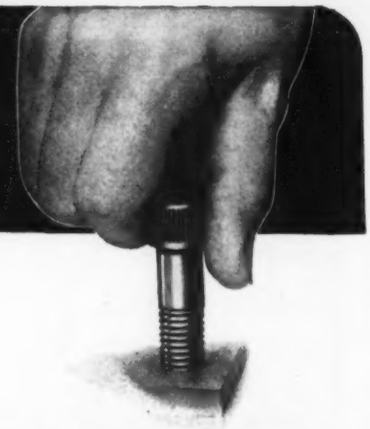
STERLING WHEELBARROW CO., Milwaukee 14, Wis.

Look for this Mark of STERLING Quality

Sterling S WHEELBARROWS

A 5652-3½A

BECAUSE OF ITS
KNURLED HEAD, SCREWS IN
FASTER AND FURTHER



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BECOMES NECESSARY

UNBRAKO *KNURLED* SOCKET HEAD CAP SCREWS

The *Knurled* Head of the "UNBRAKO" Socket Head Cap Screw does triple duty: (1) the *Knurling* provides a sure, slip-proof grip; (2) the *Knurling* speeds assembly, because it enables the "UNBRAKO" to be screwed in faster and further with the fingers—handiest of all wrenches—before a "key" becomes necessary; (3) the *Knurling* permits positive locking. Available in standard sizes from #4 to 1" diameter, in a full range of lengths. Other sizes to special order. Write for your copy of the "UNBRAKO" Catalog.

Knurling of Socket Screws originated with "Unbrako" in 1934.

Other "UNBRAKO" Products Include:
Socket Set Screws with Knurled Cup Points, Socket Set Screws with Knurled Threads, Square Head Set Screws with Knurled Cup Points, Knurled Socket Head Stripper Bolts, *Precision-Ground* Dowel Pins, *Fully-Formed* Pressure Plugs.

SPS STANDARD PRESSED STEEL CO.
BOX 523, JENKINTOWN, PENNSYLVANIA

"Serving Industry continuously since 1903 through Industrial Distributors"

Canadian Production Iron, Steel Shapes Rises for June

Toronto—Canadian production of primary iron and steel shapes for the month of June 1949 totaled 321,401 net tons as compared with 314,633 tons in May and 301,478 tons in June, 1948. In the production figures for June are included 84,736 tons of shapes shipped to producers own plants or plants within the primary industry for further processing.

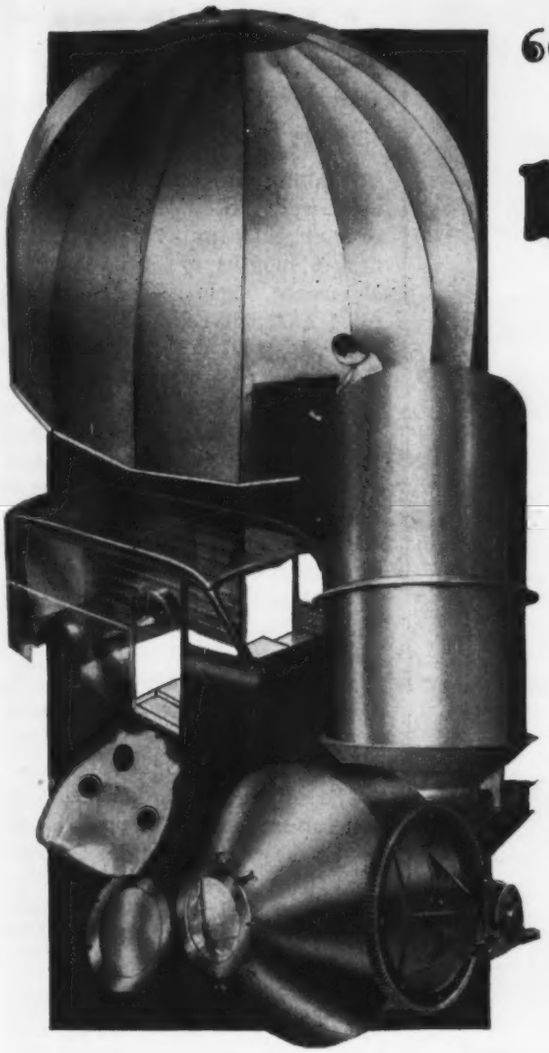
The following table shows production of primary iron and steel shapes for the month of June, in net tons:

	Carbon Steel	Alloy Steel
Billets, etc., for forging	5,900	381
Other semifinished shapes, not for re-rolling by makers	48,736	206
Structural shapes and piling	16,988	...
Plates	15,433	9
Rails	27,058	...
Tie plates and track material—		
Splice bars	1,208	...
Tie plates	5,650	...
Spikes	1,496	...
Concrete reinforcing bars	8,733	...
Hot-rolled bars for cold finishing	353	...
Other hot-rolled bars	46,648	4,979
Pipes and tubes	21,305	...
Wire rods	23,450	29
Hot-rolled black sheets	18,931	...
Cold-reduced black sheets	11,223	...
Galvanized sheets	8,569	...
Steel castings	7,561	1,337
Miscellaneous hot-rolled products	24,098	377
All other products	20,567	176
TOTAL	313,907	7,494

Primary Zinc Production Up

Toronto—Production of primary zinc in Canada in all forms in June was 27,493 tons compared with 24,840 tons in May and 19,037 tons in June 1948. For the first 6 months this year output of primary zinc in all forms increased more than 20 pct to 135,109 tons compared with 112,354 tons in the like period last year.

For June exports of refined zinc amounted to 10,648 tons valued at $2,832,081 compared with 15,142 tons valued at $4,615,469 in the month immediately preceding. For the first 6 months this year exports totaled 75,587 tons valued at $23,506,651 and exports of zinc in ore amounted to 35,254 tons.



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SAVE TIME AND DOLLARS

With Brandt's complete, versatile organization of skilled workmen and experienced engineers.

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Send part, sample or drawing. Your inquiry will be promptly expedited.

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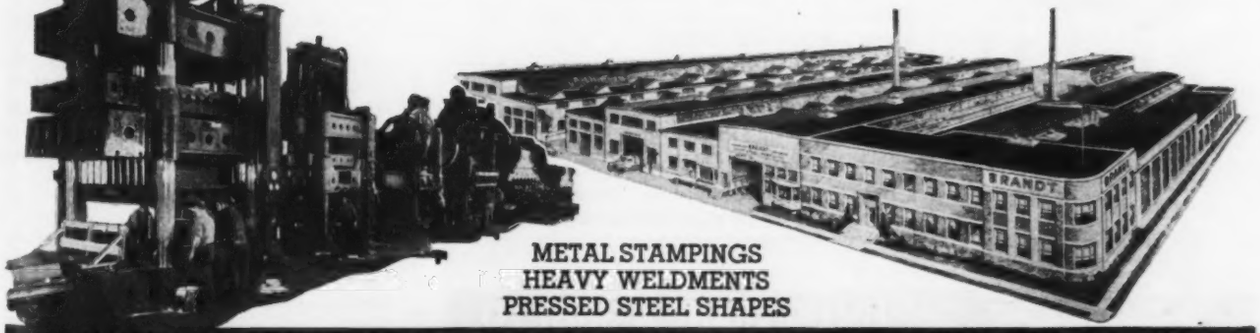

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HEAVY WELDMENTS
PRESSED STEEL SHAPES

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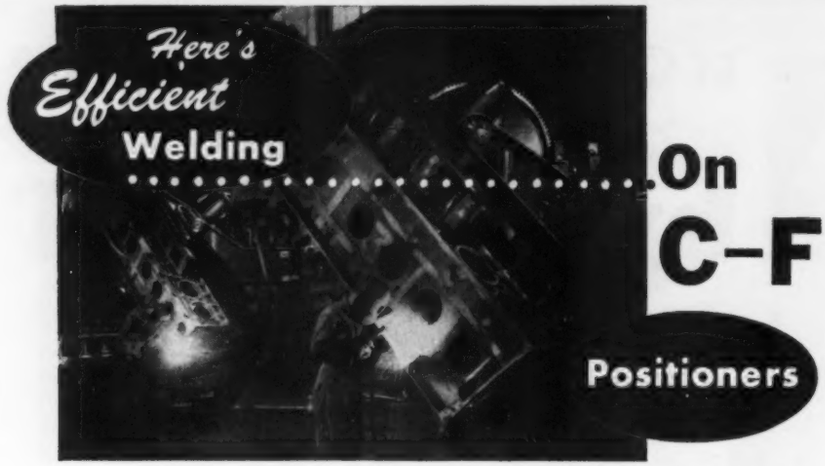

When heavy, unwieldy weldments like these diesel crankcases can be quickly swung into any position so that every weld is made *downhand*—that's efficient welding!

Welders spend more time welding—do better welding at lower cost when they work with C-F Positioners because these hand and/or power operated machines reduce positioning time to a minimum. Investigate the cost-saving advantages of C-F Positioners. They pay their way in any company.

Write for Bulletin WP24—an illustrated circular detailing the *Specific* advantages of C-F Positioners.

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C-F positioned welds mean better, more economical welds

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It features: MILL TYPE MOTORS—MAGNETIC CONTROL—MASTER SWITCHES IN CAB—DYNAMIC LOWERING—HYDRAULIC TROLLEY BRAKE—SPRING BUMPERS—SAFETY FACTOR OF 8.

Here is *power* when you want it and *strength* where you need it with coordinated precision control for ease of operation.

EUCLID CRANES AND HOISTS Raise Profits

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Iron, Steel Exports Exceed Imports by 2.5 Million Tons

Washington—Exports of iron and steel were nearly 2.5 million tons greater than imports during the first 6 months of 1949. Outgoing shipments, exclusive of scrap, totaled 2,826,640 net tons during the 6-month period, while imports totaled only 346,304 tons.

These figures were reported recently by the Commerce Dept. and the American Iron & Steel Institute. The two offices at the same time placed June exports at 547,638 tons, and imports during the same month at 16,761 tons.

Tinplate continued to lead all other products in volume of export, accounting for 62,836 tons of the June total. Plate accounted for 5879 tons of all iron and steel products imported, with ingots running a close second at 5545 tons.

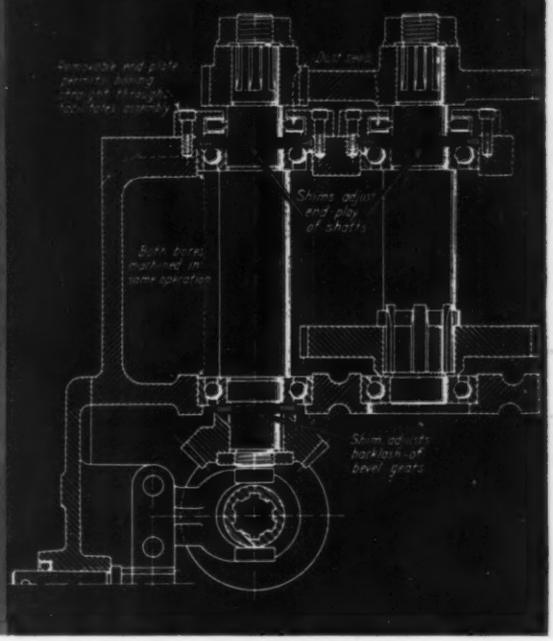
The product-by-product tabulation for exports and imports issued jointly by the two offices follows:

EXPORTS:	June 1949	First 6 Months 1949
Semifinished and Finished Products:		
Ingots, blooms, billets, slabs, sheet bars	29,440	129,146
Wire rods	10,000	29,181
Skelp	13,986	53,724
Concrete reinforcement bars	15,146	66,934
Steel bars, cold-finished	5,002	24,828
Other steel bars (excluding alloy)	29,917	165,988
Alloy steel bars	1,909	13,974
Welding rods, electric	1,250	10,304
Plates including boiler, not fab.	43,906	217,863
Plates, fab., punched or shaped	974	15,954
Iron sheets, black	2,584	11,659
Steel sheets, black	46,566	269,730
Galvanized sheets	8,599	42,270
Strip steel, cold-rolled	5,679	35,761
Strip steel, hot-rolled	8,870	49,429
Tinplate	62,836	325,479
Terneplate	924	6,850
Structural shapes, plain	44,724	190,860
Structural shapes, fab.	13,592	83,753
Frames and sashes	307	1,736
Sheet piling	3,238	10,614
Rails, 60 lb per yd and over	25,459	122,929
Rails, less than 60 lb per yd	385	4,493
Rails, relaying	2,607	16,766
Splice bars and tie plates	2,203	13,183
Frogs and switches	235	4,110
Railroad spikes	399	2,143
Railroad bolts, nuts, and washers	152	1,157
Car and locomotive wheels, tires and axles	4,947	23,100
Seamless black pipe and tubes	2,296	14,768
Seamless casing and line pipe	20,999	148,158
Seamless boiler tubes	4,123	23,681
Welded black pipe	13,003	53,871
Welded galvanized pipe	7,366	40,227

EXPORTS:	June 1949	First 6 Months 1949
Welded casing and line pipe	27,092	113,271
Welded boiler tubes	480	2,342
Other pipe and fittings	6,551	39,150
Plain Wire	7,870	46,248
Galvanized wire	7,319	36,265
Barbed wire	8,607	33,208
Woven wire fencing	1,938	9,374
Woven wire screen cloth	393	2,640
Wire rope and strand	1,039	7,574
Wire nails	4,082	15,125
Other wire and manufactures	2,291	13,205
Tacks	128	1,103
Other nails, incl. staples and horseshoe nails	1,190	6,025
Bolts, nuts, rivets and washers, except railroad	2,228	16,050
Forgings	2,362	16,429
TOTAL	507,312	2,583,664
Other Finished Products:		
Tanks, complete and knocked down	9,861	66,278
Metal lath	322	3,995
Tin and galvanized hollow ware	187	1,488
Tin cans, finished or unfinished	2,673	20,723
Mall, iron screwed pipe fittings	577	3,466
Cast iron screwed pipe fittings	44	552
Cast iron pressure pipe and fittings	4,323	24,487
Cast iron soil pipe and fittings	1,543	5,369
Iron castings and ingot molds	5,838	28,704
Steel castings	170	1,240
Sprocket and other power trans. chains	491	3,013
Other chains	404	3,406
TOTAL	26,433	162,661
Pig iron	12,598	66,994
Ferroalloys	1,295	13,321
TOTAL	13,893	80,315
GRAND TOTAL	547,638	2,826,640
Iron and steel scrap	54,725	199,238

IMPORTS:	June 1949	First 6 Months 1949
Semifinished and Finished Products:		
Steel ingots, blooms, etc.	5,545	26,063
Wire rods	316	2,672
Concrete reinforcement bars	95	4,217
Hollow bar and drill steel	1	34
Other steel bars	86	17,746
Boiler and other plate	5,879	23,633
Sheets, skelp, sawplates, n.e.s.	280	8,194
Tinplate, tagger's tin and terneplate	—	37
Other hoops and bands	—	5,286
Structural shapes and sheet piling	927	110,709
Rails and fastenings	9	922
Pipe and tubes	476	5,010
Flat wire and strip	215	954
Telegraph and telephone wire	105	281
Wire rope and strand	56	288
Nails, tacks and staples	37	1,163
Die blocks and blanks	—	643
TOTAL	14,057	208,335
Pig Iron	213	77,729
Sponge Iron	255	1,534
Ferromanganese (mang. content)	1,510	49,507
Ferrosilicon (silicon content)	84	520
Ferrochrome (chromium content)	84	1,938
Other alloys used in steel manufacturing	539	6,508
TOTAL	2,685	137,736
GRAND TOTAL	16,761	346,304
Iron and steel scrap	91,838	932,062

Answer to GEAR MESH and END-PLAY problems



IF YOU'RE WASTING TIME AND TYING UP A STANDBY LATHE . . .

Laminated shims can stop the expensive process of assembly, testing, disassembly, machining a few thousandths, reassembly, retesting and so on for many costly hours.

DO WHAT THIS LEADING MACHINE TOOL MANUFACTURER DID . . .

In the milling machine above, bores for inner and outer bearings are machined to one diameter in one operation. Removable end-plate permits boring straight through outer bearing housing and makes assembly of shaft, bearing and dust seal much simpler. SAVING: hours of machining and assembly time.

AND SIMPLIFY YOUR ADJUSTMENTS BY USING LAMINATED SHIMS . . .

Backlash of bevel gear and end-play of the two shafts are adjusted right at the job by peeling .002" laminations off the shims—with a penknife. Shaft and end-plate dimensions are calculated for shim thickness of .052". Shims are stamped at our plant from standard .062" (1/16") LAMINUM stock. RESULT: cumulative machining tolerances of —.010 to +.020" are possible.

Send today for our new data file with specifications, design factors and applications. Sample of ***LAMINUM*** included.

SEND FOR CATALOG AND SAMPLES

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Press capacity to 100 tons, 24 inches square, shallow draw. Special equipment and variety of dies can eliminate die-making for short runs. Wide stock of materials. Let us quote on your *difficult* jobs.

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"What's so good about H-VW-M polishing wheels?"

JOHN D. KERSHAW
Field Representative
H-VW-M Grand Rapids
Michigan Office

I like customers to ask frank questions. This fellow wanted facts, and no fooling. Of course, handling H-VW-M's line of electroplating and polishing equipment gives a guy plenty to talk about, so I got down to brass tacks.

"Show me any polishing job you have, and I'll show you an H-VW-M wheel that will do it better and save you money to boot," I offered.

"'Big talk,' you say? Well hold on a minute, we can back that up. H-VW-M has put a lot of years into testing and developing its line of polishing equipment, and 'by George' they know wheels inside out. They know whether cotton, canvas, leather or felt is best for the job; know how to cut, sew and glue the fabrics to withstand crushing and tearing strains incident to sharp, high-speed polishing; know how to provide sufficient flexibility, uniform density and proper balance so essential to maximum efficiency and long wear.

"But," I went on, "the important thing is that H-VW-M applies this knowledge to each wheel it turns out. That means when you specify H-VW-M polishing wheels, you're sure of getting the right wheel for your job every time.

"Tell you what," I concluded, "let's take a look at some of your polishing problems right now. We find that first hand analysis usually pays off in big savings to customers —and that's a service that is available to you anytime."

Ask your H-VW-M representative to help you solve your polishing problems, or write to "Headquarters"* for a copy of Bulletin W-102. It describes our complete line of polishing wheels and accessory products.

Hanson-Van Winkle-Munning has supplied the plating industry for over 70 years. Our sales-engineers are thoroughly familiar with every step in the process of electroplating and polishing. It is this overall knowledge that has made H-VW-M "Headquarters" for electroplating and polishing equipment, supplies and technical assistance.

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3860

Controversy Over Use Of Colorado River Water

Los Angeles—Industrialists of this area are watching with considerable concern the outcome of a controversy between California and Arizona over the use of Colorado River water.

It is conceded locally that water supply may well determine the industrial future of the area as well as its population growth and in such cities as nearby Torrance, where Columbia Steel Co. has one plant and has announced conversion of the Alcoa plant into a coal reduction mill, the situation is almost critical. At present this area is adequately supplied from the Metropolitan Water District but future growth and expansion will eventually be limited unless additional supplies become available.

The city of Los Angeles is probably in the best position of all southern California communities as it has water available from the Owens River but even here where population may well reach 9 million people according to some of the best estimates, there would not be an abundance of water for industry.

Arizona's claim to Colorado River water is based on its need for the development of rich agricultural areas in the central Arizona reclamation project.

At present the controversy is in the hands of Congress and it is believed that a final decision will eventually be made by the United States Supreme Court on this issue which has been a matter of dispute for approximately 20 years.

Mfg. Council Elects Officers

New York—William F. Chase was elected president of the Smaller Manufacturers' Council of Pittsburgh at a meeting of the board of directors. Mr. Chase is also president and treasurer of Bearing Service Co.

Other officers elected were: E. M. Rodenbaugh, first vice-president; D. D. Munroe, second vice-president; L. L. Vayda, secretary and H. A. Calderwood, treasurer.

WHEN TO USE FEDERAL SINGLE ROW RADIAL FELT SEAL BALL BEARINGS

Where dirt, dust or other foreign matter is a problem—with combined radial and thrust loads in any direction—the design and operating features of Federal Single Row Radial Felt Seal Ball Bearings hold the answer.

These bearings provide effective protection of the vital bearing parts. The felt is held securely between two plates fitted into a groove in the outer ring. The seal rides on a frictionless surface on the shouldered inner ring. Either single or double seals can be provided for any size, in standard or wide outer ring types.

Federal Felt Seal Ball Bearings incorporate all the load-carrying advantages of Federal Conrad Type Bearings. In load combinations, thrust loads up to 50% of the radial rating can be applied. For pure thrust the rating is 100% of the rated radial load.

In our catalog "K" you'll find detailed descriptions of these and all bearings in the Federal line—every type and size, shielded and sealed—for every anti-friction need. Its 260 pages contain ball bearing selection charts to help you compute bearing loads, determine capacities at every speed, and select the type and size bearing best suited to your individual application. Write for your copy today.

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Cut Gears for Industrial Needs!

For special gears in larger sizes—exact duplicate gears for replacements—for every heavy-duty industrial gear application—look to SIMONDS GEAR where specialty gears for heavy industry have been a custom service for more than 50 years. Within easy shipping distance of many heavy industry plants—with a personalized service designed to meet your most exacting specifications—SIMONDS GEAR provides an unusually prompt and efficient service on even the most unusual gear requirements. Sizes range up to 145" dia. in all popular gear-making materials. Send your inquiry today and get acquainted with SIMONDS GEAR Service.

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BEVEL GEARS • MITRE GEARS
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SIMONDS GEARS

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THE SIMONDS GEAR & MFG. CO.
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• *News of Industry* •

Lobbying Probes to Be Conducted Solely by the House

Washington—Any investigation of lobbying activity will be conducted solely by the House of Representatives.

This development was made clear recently when the Senate declined to participate in a proposed probe of lobbying. The upper chamber in effect told the House to go ahead on its own if it felt that the subject warranted investigation. The House has passed a resolution authorizing such an investigation.

There is considerable pressure within Congress for such an investigation, but some leaders are fearful that the results of such a probe would cast as much discredit on one political party as the other.

President Truman has repeatedly called upon Congress to investigate the operations of the real estate lobby in Washington.

Atomic Energy Group Meets

Washington—A delegation of 11 United States representatives, headed by Dr. Charles K. Leith of the University of Wisconsin, is attending a three-nation atomic energy conference which has opened in London.

In addition to technical experts of the AEC, members of the delegation include Dr. W. Hirschkind, research director of Dow Chemical Co., Thorold F. Field, consulting mining engineer, and Dr. Bertram D. Thomas, an acting director of Battelle Memorial Institute.

Purpose of the conference, the third of a series, is to study problems of locating, mining and processing radioactive ores.

Fentron Steel Opens Office

San Francisco—Fentron Steel Works has opened an office in San Francisco at 607 Market St. where Raymond DesCamp, formerly chief estimator at the Seattle home office, will be in charge.

Invest

ZERO For Equipment For Raw Material

You Can Lease Air Products Generators and make your own

BY THE CUBIC FOOT

OXYGEN

BY THE TON

The raw material, air, is free. You invest nothing for equipment. You'll find operation of Air Products generators is simple and requires little time; that the rental is fair and the advantages many:

- You avoid delivery failures.
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- You assure your supply at low cost.

These same generators also produce high-quality nitrogen gas.

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Frameless tanker built of Mayari R by Advance Auto Body Works. Deadweight reduction has permitted 700-gal increase in payload. Tanker has full-oscillating fifth wheel to fully absorb the twisting action of tank. The 4-in. steel-tubing flow lines and valves permit high-speed gravity dump.

700 EXTRA GALLONS RIDE FREE

Frameless construction combined with the use of Mayari R low-alloy, high-strength steel has eliminated several hundred pounds of surplus deadweight while adding 700 gallons of additional payload capacity to the modern tanker pictured above.

Built by Advance Auto Body Works of Los Angeles for the Union Oil Company, this five-compartment, 5720-gal job is designed to carry the maximum legal payload on four axles. The self-supporting tank construction has done away with some of the deadweight by eliminating the need for conventional frame members. The remainder of the saving is accounted for by the use of 12-gage Mayari R low-alloy, high-strength steel instead of 10-gage or heavier carbon steel in the shell, baffle plates and heads of the tank.

Because of its superior properties and relatively low cost, Mayari R has been widely used for reducing deadweight in many types of trucks, trailers, buses and other commercial vehicles. It has made substantial increases in payload capacities and at the same time has reduced the high cost of maintenance for fleet operators from New England to Southern California.

A new booklet dealing with the properties, workability, and applications of Mayari R is yours for the asking. Write or phone for a copy.

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